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CONTENTS

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***Includes programs: BALLBOUNCE and BLACKBOARD (for the 64)
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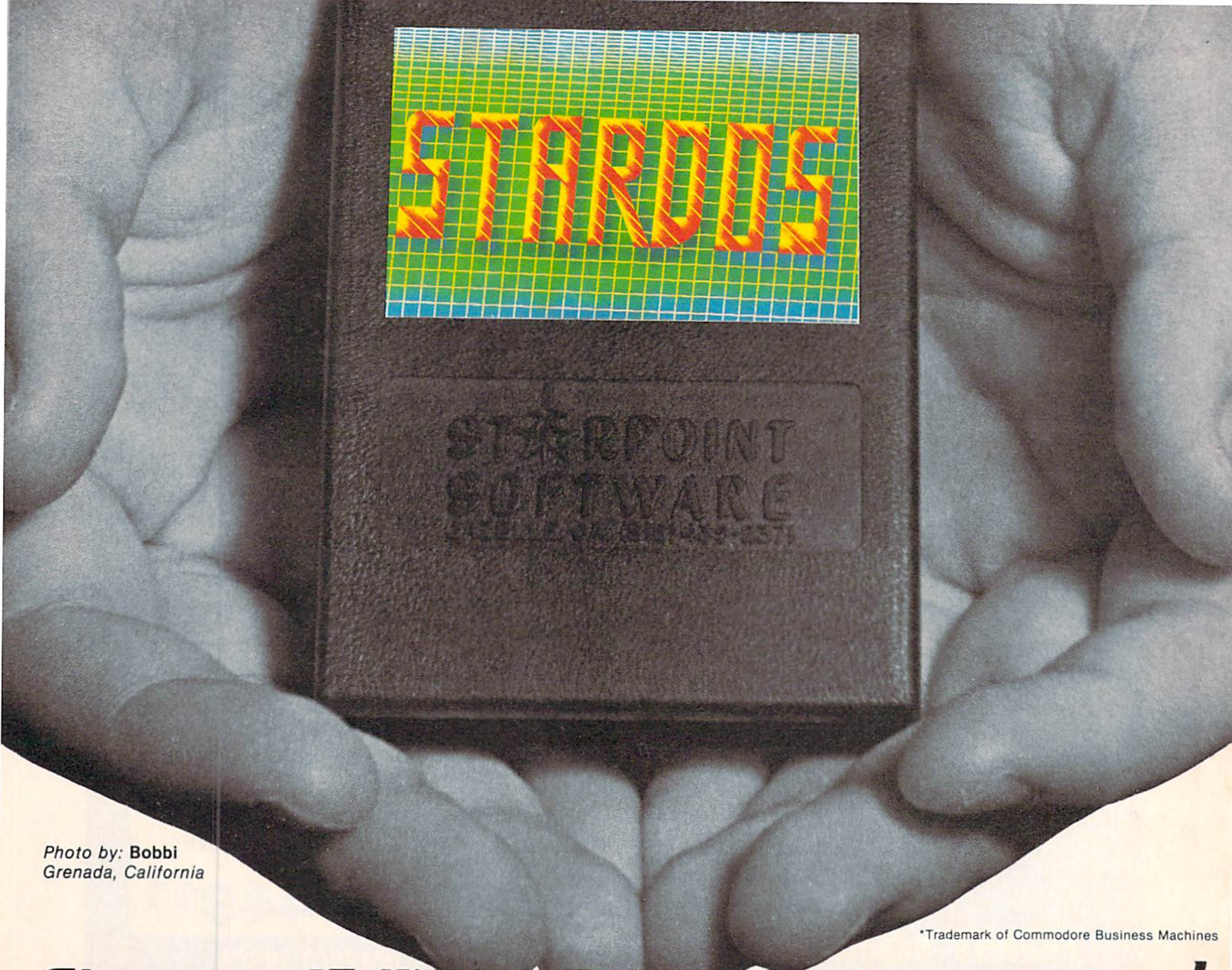


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VIEW FROM THE BRIDGE

We'd love to jump right on this month's big news—the debut of our Entertainment Software Section—but feel obliged to begin with an apology. Several features pre-announced last month do not appear in this issue. An assortment of factors combined to force us to do what we like to do least: break our promise to you. All this month's phantom features have been rescheduled for upcoming issues.

Another broken promise: we told you last month our entertainment section would be eight pages long. But Arnie Katz was so thrilled at the chance to establish a definitive monthly forum for the Commodore entertainment market that he ran on to ten pages. Arnie begins this month with *Call to Adventure,* a look into the theory and history of adventure games. He and other games experts provide reviews of six current Commodore titles, adventure and otherwise. (Turn to page 49.)

But our newly expanded coverage of the games market doesn't mean we'll stop offering the best program and articles available on every other aspect of Commodore home computing:

Caving in to the complaints of readers who can't wait until they've completely entered an *Ahoy!* program to see all their typos, we present the *Instant Bug Repellent.* (Turn to page 73.)

If your budget is so tight that you haven't yet purchased one of the many quick-loading utilities for the C-64, *Lightning Loader* will provide some low-budget relief. (Turn to page 74.)

File Scout supplies screen and printer output of the most important file parameters for PRG, SEQ, and USR file types. (Turn to page 70.)

Technical Editor David Barron's *Rhythmic Bits* provides control over the usually neglected component of Commodore music-making: rhythm. (Turn to page 76.)

The Knight's Tour brings to the computer screen a chess puzzle that dates back to the Middle Ages. (Turn to page 73.)

Chopper Flight requires you to maneuver between two adjacent apartment buildings, rescuing the prisoners of ruthless terrorists. (Turn to page 117.)

You've never seen a snake *Slither* as fast as the one you must maneuver through a vast array of mazes, gulping down prizes. (Turn to page 35.)

Sprites are by nature highly kinetic creatures, but Orson Scott Card has done a stellar job of pinning them down in the last few installments of *Creating Your Own Games on the VIC and 64. Interrupting Your Way to Fast Motion* provides a machine language interrupt routine that will let you move one sprite but animate eight. (Turn to page 18.)

What do you get if you place an infinite number of monkeys at an infinite number of typewriters? Don't drain your bank account to find out—Dale Rupert solves the age-old puzzle the mathematical way in this month's *Rupert Report* on *Monkey Business.* (Turn to page 37.)

Many writers have dealt with high-resolution graphics within these pages, but Mark Andrews approaches the subject with special attention to the student of machine language in *Getting Graphic,* this month's edition of *Commodore Roots.* (Turn to page 91.)

Envious of the great programs Dale Rupert, Orson Scott Card, and Mark Andrews include with their columns each month, Cheryl Peterson gets into the act with *CompuLoan,* a loan payment calculator provided with this month's *Cadet's Column.* Also included: *TX2BAS,* an enhanced version of one of the more useful short utilities available in the public domain. (Turn to page 97.)

There's much more inside, which we'll let you discover for yourself. (But don't overlook pages 75 and 77. They provide details on the new *Ahoy! Access Club*—an organization that will make you bless the day you became an *Ahoy!* subscriber. Or become one right away!)

—David Allikas

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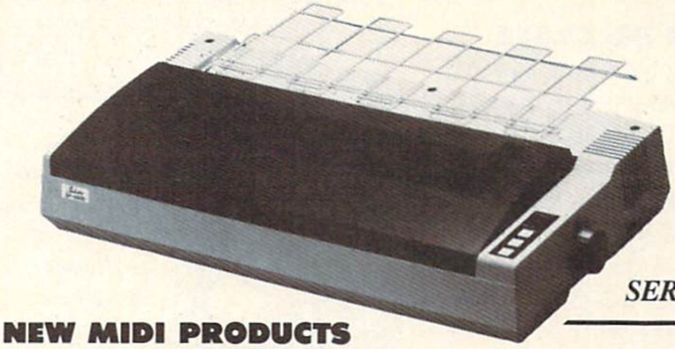
The D12/10 prints at 12 characters per second, utilizing Brother ribbons and daisy wheels. Eight languages and numerous print capabilities are supported.

Included with both printers is a built-in Commodore interface and a disk-based version of Professional Software's *Fleetwriter* word processor (see review in May '85 *Ahoy!*).

Blue Chip Electronics, Inc., Two West Alameda Drive, Tempe, AZ 85282 (phone: 602-829-7217).

The SP-5500 Professional Printer will print up to 136 columns at 180 characters per second. Also offered are near letter quality print, graphic capabilities, downloadable character sets, and 3K buffer. Price is $699.00.

Sakata U.S.A. Corporation, 651 Bonnie Lane, Elk Grove Village, IL 60007 (phone: 312-593-3211).



The SP-5500 prints 180 cps at a 60dB(A) noise level. NLQ mode and graphics are supported. READER SERVICE NO. 298

OKIMATE 10 PRICE CUT

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Okidata, 532 Fellowship Road, Mt. Laurel, NJ 08054 (phone: 609-235-2600).

NEW MIDI PRODUCTS

MIDI/4 plus ($99.95) and *MIDI/8* ($149.95), four and eight channel recording programs for the C-64, feature auto-correct (perfects every performance rhythmically down to 32nd note triplets), punch in/out (allows editing anywhere in the piece without re-recording previously entered parts), fast forward/rewind, sequence chaining, and sync to tape, MIDI and drum machines. Still included is the original *MIDI/4*'s multitrack tape recorder qualities with unlimited overdubs, and real-time editing. A MIDI synthesizer and the Passport MIDI interface with tape sync are required. (Current *MIDI/4* owners can upgrade for $35.00.)

Passport Designs, Inc., 625 Miramontes St., Half Moon Bay, CA 94019 (phone: 415-726-0280).

From Q-R-S Music Rolls comes *MIDI Magic* ($49.95), a cartridge that connects the C-64 or C-128 to MIDI instruments. Included is a six-song demo disk.

Q-R-S Music Rolls Incorporated, 1026 Niagara Street, Buffalo, NY 14213 (phone: 716-885-4600).

BASIC HELP SCREENS

Help Master 64 provides the user a set of online help screens for all 69 commands of C-64 BASIC, supplying verbal descriptions of commands and their parameters, abbreviations, syntax examples, and reference page numbers for the *C-64 User's Guide, Programmers' Reference Guide*, and the *Handbook of BASIC for the Commodore 64* (included with the *Help Master* package). The program uses none of the BASIC RAM employed by programmers, or interferes with programming in any way. It is also compatible with the Commodore DOS wedge.

Master Software, 6 Hillery Court, Randallstown, MD 21133 (phone: 301-922-2962).

HARMONY NAME CHANGE

International Tri Micro's integrated spreadsheet/database/business graphics program, announced in the June *Scuttlebutt* (see page 7), has undergone a name change, from *Harmony* to *TEAM-MATE.* A C-128 version will be added by September 15; owners of the C-64 version will be able to upgrade for $5.00.

International Tri Micro, 1010 N. Batavia, Suite G, Orange, CA 92667 (phone: 714-771-4038).

FOUR HOME UTILITIES

Peace of Mind comprises four home utilities for the C-64: *Home In-*

ventory (for up to 200 personal belongings), *Credit Card Guardian* (holds data on up to 60 cards), *Private Messages* (100 lines of requests, instructions to family members, sentimental messages—morbid enough for you?), and *Vital Statistics* (50 pages of important facts about bank accounts, location of will and safe deposit box key, etc.). On disk; $19.95.

Spectrum 1 Network, 9161 Beachy Ave., Arleta, CA 91331 (phone: 818-897-2060).

NEW GAME RELEASES

More details on the three new MicroProse simulations for the C-64 mentioned last month, each $34.95:

Gunship simulates the new AH-64 Apache attack helicopter, with multiple weapon and navigation systems and 3D graphics. The pilot maneuvers among multiple building and terrain environments on one of seven missions that include anti-tank sorties, rescues, and covert operations.

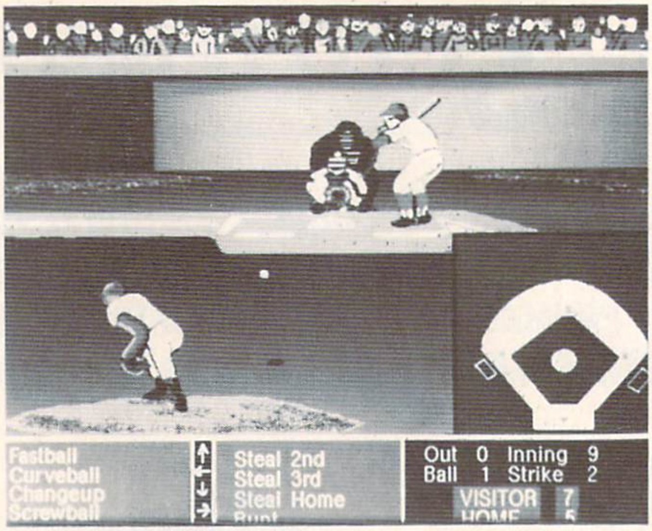
Silent Service lets you captain your own WWII United States submarine, with simulated views from the engine room, conning tower, and ship's bridge, combat with both the 5 inch gun and Mark XIV torpedoes, and strategic play utilizing maps and charts of the Southwest Pacific.

Acrojet allows pilots who have soloed in MicroProse's *Solo Flight* to fly their own BD5-J jet in an aviation decathlon that includes spot landings, ribbon cuts, and other high performance maneuvers.

In conjunction with Cessna Aircraft Company, MicroProse is holding a "Learn to Fly" contest. The winners receive a chance to qualify for a pilot's license, a solo package, or an introductory flight on a Cessna. Details will be packaged with MicroProse's *Solo Flight, F-15 Strike Eagle,* and *AcroJet.*

MicroProse Software, 120 Lakefront Drive, Hunt Valley, MD 21030 (phone: 301-667-1151).

Battalion Commander ($39.95), designed for beginning to intermediate C-64 war strategists, consists of five scenarios: Novice, Pursuit and Exploitation, Meeting Engagement, Attack, and Defense. Nationality of



Hardball, *latest in a long line of computer baseball simulations claiming to be "the most realistic ever," is both action and strategy oriented. READER SERVICE NO. 299*



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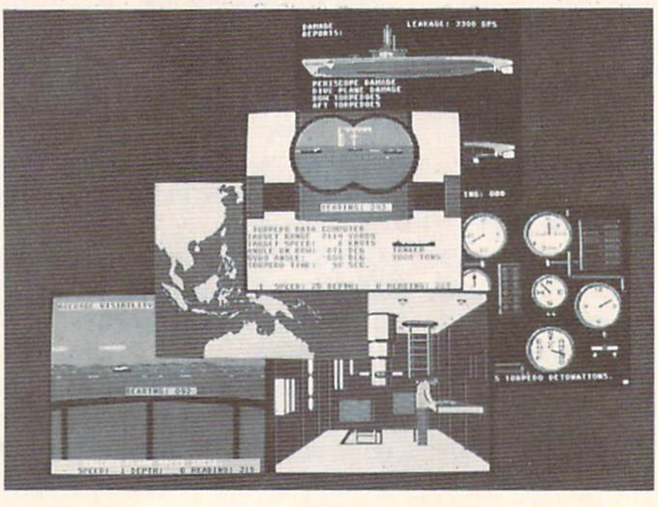
opposing forces (US, Soviet, or Chinese), their relative strength, and type of terrain can all be adjusted.

Strategic Simulations Inc., 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043-1983 (phone: 415-964-1353).

From Accolade, the new venture of Activision founders Alan Miller and Bob Whitehead, comes *Hardball* ($29.95), a baseball contest for the 64 and 128 offering three field perspectives and six different pitches—fastballs, sinkers, sliders, curves, screwballs, and changeups. In addition to controlling his players by joystick, the manager must make decisions concerning substitutions, base stealing, positioning of fielders, and more.

Accolade, Inc., 20863 Stevens Creek Blvd., Cupertino, CA 95014 (phone: 408-446-5757).

Brimstone ($39.95) challenges Sir Gawain to escape from the underworld of Ulro. Packaged in hard-



Silent Service *provides a variety of scenarios, from single ship attacks to multipatron missions. Sophisticated attack plotting system utilizes maps and charts of entire Southwest Pacific.*

bound book form, the interactive text adventure for the C-64 operates in real time, with a constantly changing universe of characters and events.

Synapse Software, subsidiary of Broderbund Software, 17 Paul Drive, San Rafael, CA 94903-2101 (phone: 415-479-1170).

International Hockey, a sequel to *Slapshot Hockey,* includes the same speech synthesis and true two-player action, but now allows the user to play against the computer. Additionally, overly aggressive play will now provoke a bench-clearing, glove-throwing fight scene, after which penalty shots can be awarded. For the C-64; $24.95.

Artworx Software Company, Inc., 150 North Main St., Fairport, NY 14450 (phone: 800-828-6573 or 716-425-2833).

Bust-A-Program challenges users to load, save, copy, and gain entrance into a basic program listing by discovering and using assorted programming clues. The program itself will show you how to copy and list protect your own programs. When you break into it and modify it, you'll get a chance to win some computer products. On tape or disk for the C-64, C-128, C-16, or VIC 20; $12.95.

Creative Enterprises, P.O. Box 4253, 1714 Sandalwood, Thousand Oaks, CA 91360 (phone: 805-492-0568).

Three new C-64 releases from Microphys, each $24.95; *Scrab Bull* (like the TV show of almost the same name), *Wrath of Otto* (patterned after the TV show *Press Your Luck!*), and *Cryptograms.*

Microphys, 1737 West 2nd St., Brooklyn, NY 11223 (phone: 718-375-5151).

SING-ALONG SOFTWARE

An improved version of *Christmas Carols* features professionally arranged versions of 18 traditional holiday songs, utilizing all three of the 64's voices and revised for easier singing. The words appear in easy-to-read verses under Christmas scenes.

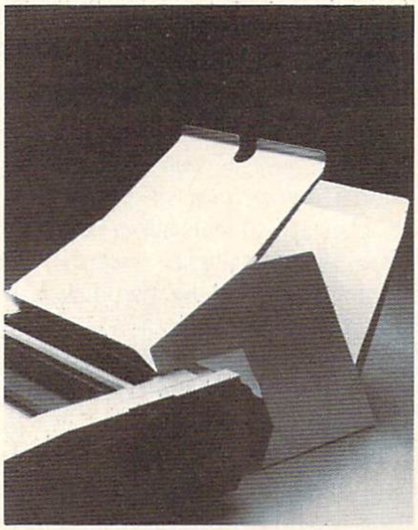
Party Songs also features 18 traditional favorites arranged in three-part harmony, such as *Oh! Susanna, Red River Valley,* and *My Old Kentucky Home* (not to mention *Who Threw the Overalls into Mistress Murphy's Chowder?*).



Words appear onscreen while your favorite carols play. READER SERVICE NO. 102

Each is available on disk for $15.95.

John Henry Software, 1252 Crestwood Hills Drive, P.O. Box 745, Vandalia, OH 4537 (phone: 513-898-7660).



Holds paper entering/leaving printer. READER SERVICE NO. 103

FANFOLD I/O SYSTEM

Positioned behind your printer, the Porter system will hold blank paper and display and store the resulting printout. Up to 1000 sheets of fanfold paper can be accommodated in eight inches of space. Cables can exit from the left, right, or rear of the printer without interfering. Price is $64.50 for the 80-column model and $74.50 for the 136-column model.

Peri-Comp, Inc., P.O. Box 188, Lake Geneva, WI 53147 (phone: 414-248-8585).

EDUCATIONAL PROGRAMS

Utilizing animated color graphics, *The Body in Focus* lets children aged 10 and up examine the body's inner

NEW

FOR COMMODORE 64 / 128

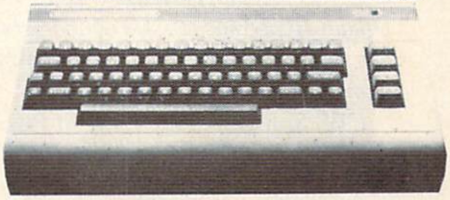
HOME INFORMATION MANAGEMENT SYSTEM

INTEGRATED HOME DATA MANAGER with WINDOWS, ON SCREEN CALCULATOR, and CALENDAR.
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Reader Service No. 119

WHY PAY MORE ?



$99.45 COMPLETE

Thousands of these MADE IN AMERICA printers have been sold worldwide at $140 for use in homes, businesses, and schools. Through our immense buying power for internal consumption we can offer you the identical printer at less than $100.

THE ONLY 80 COLUMN PRINTER FOR UNDER $100
.... ANYWHERE IN THE WORLD !

We use this printer in our own communications systems because of its small size, reliability, and quiet operation. You'll love it because of dot-addressable graphics that'll knock your socks off. It's even compatible with popular C64 and VIC20 graphics programs like:
BRODERBUN'S PRINT SHOP.
You'll love it because it's 80 characters per second, blows the doors off all other low cost printers. You'll even love it because of what it doesn't do,
......MAKE NOISE.
This baby's so quiet you can run listings in the middle of the night and Mom and Dad won't even know you're up. If you're a tad bit older, you'll love the way it prints your spreadsheets in a full
160 COLUMN FORMAT
on 8 1/2 inch wide paper. Schools buy 'em by the boatload. Now you can sail one of your own.

BUY ON YOUR BANKCARD FOR SAME DAY SHIPMENT.
MASTERCARD & VISA GLADLY ACCEPTED.
FOR IMMEDIATE ACTION CALL:

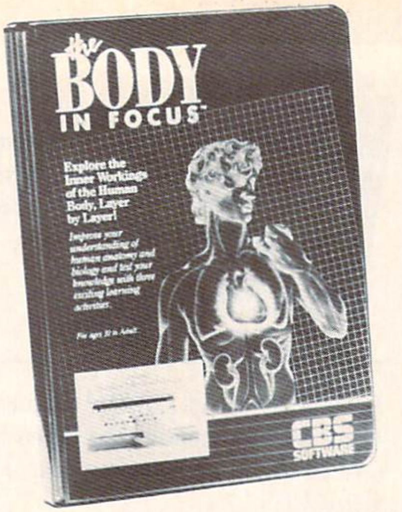
1-800-672-3470 X841 IN CALIFORNIA
1-800-538-8157 X841

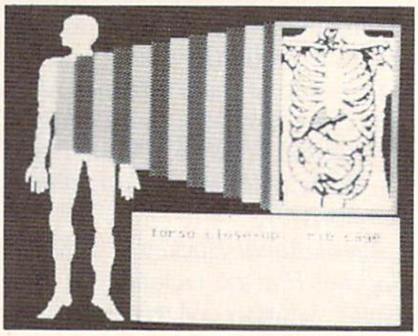
POST TECHNOLOGIES, INC.
CHOWCHILLA, CA

(SMACK IN THE HEART OF SILICON VALLEY SOUTH.)

Reader Service No. 120

workings through three learning activities: *Body Systems* (demonstrates mechanisms of the muscular, digestive, nervous, skeletal, respiratory, circulatory, endocrine, and integumentary systems), *Body Close-Ups* (lets users peel away body layers to inspect organs in detail), and *Body I.Q.* (tests overall knowledge of anatomy). Included is CBS' EasyKey keyboard overlay, which provides easy access to program activities. For the C-64; $39.95.





Observe how the body breathes, digests food, pumps blood, moves muscles, sneezes.
READER SERVICE NO. 116

Consumers who purchase a 10-pack of Elephant brand disks will receive a trial version of CBS' *Success with Math* and *Success with Algebra* tutorials, plus a $5.00 rebate coupon good for the purchase of *The Sea Voyagers, America Coast-to-Coast, Dinosaur Dig,* and *Dream House* and a $3.00 coupon good for *Astro-Grover, Webster: The Word Game*, and *The Railroad Works.*

CBS Software, One Fawcett Place, Greenwich, CT 06836 (phone: 203-622-2500).

Thinkers' Exercise, a brochure listing over 40 CP/M based educational programs for use with the C-128 and 1571 disk drive, is available on request from Resource International, 330 New Brunswick Ave., Fords, NJ 08863 (phone: 201-738-8500).

Another of those astonishing programs that manage to be targeted for "the beginner as well as the professional," *Principles of Composition* teaches art students about color, texture, design, shapes, patterns, and more. Price for the two-disk C-64 program is $149.00.

Art Instruction Software, P.O. Box 1352, Patchogue, NY 11772 (phone: 516-654-0351).

Krell Software's *Logical Lynx* is designed to teach students basic scientific facts and how to fit these facts into meaningful patterns. System master disks are available in three levels of difficulty at $49.95, $69.95, and $89.95 each; twenty databases in the categories of social studies, humanities & language arts, and science & math are priced at $19.95 each (one free database is included with each master disk). For the C-64.

Krell has also announced that they will accept trade-ins of obsolete SAT and ACT preparation software—both their own and competitive brands—for up-to-date products.

Krell Software Corp., 1320 Stony Brook Road, Stony Brook, NY 11790 (phone: 516-751-5139).

Educational Activities' latest catalog for educators, listing over 50 new programs, is available upon request.

Educational Activities, Inc., P.O. Box 392, Freeport, NY 11520 (phone: 516-223-4666).

Classroom Tools for the Teacher, Sunburst's 1985-86 educational software catalog, includes 40 new programs for students from preschool through adult.

Sunburst Communications Inc., Pleasantville, NY 10570 (phone: 914-769-5030).

Elementary Math Skills teaches elementary schoolers fundamentals of arithmetic, on four levels of difficulty. For the 64; $24.95.

Microphys, 1737 W. 2nd St., Brooklyn, NY 11223 (phone: 718-375-5151).

Learning Guitar Overnight ($39.95) teaches C-64 users basic chord recognition, with strum-along sound effects allowing students to recognize and play simple songs immediately.

Chipware, P.O. Box 110, Chester, NH 03036 (phone: 603-432-1717).

PROMAL NEWSLETTER

PROMAL News, a quarterly compendium of news, programming tips, and articles, will be distributed free to all registered PROMAL users. For information, contact Systems Management Associates, 3325 Executive Drive, P.O. Box 20025, Raleigh, NC 27619 (phone: 919-878-3600).

VIDEOTAPE DATABASE

VideoFile allows C-64 users to keep track of up to 150 programs recorded on up to 50 videotapes, filing the programs by category, by length, or alphabetically. The program can locate the best space to record new material, or find any program. Price is $49.95; demo disk $10.00

THE PUZZLE GENERATOR

Attention puzzle fans! Use your computer to create criss-cross and wordsearch puzzles from any list of words, including foreign languages! Features:

- Over 1 Billion different puzzles included. This would cost over a million dollars anywhere else!
- Highly educational. Testing reveals that persons possessing basic puzzle solving skills have an easier time dealing with lifes everyday problems.
- Puzzle difficulty ranges from very easy to very difficult, to challenge even the most experienced puzzle solvers.
- Create special interest puzzles for your group or organization.
- Super easy to use. Just answer screen prompts and the program does the rest.
- Disk Drive and Printer are required. Supports all compatible drives and printers. Puzzles, answers and wordlists can be saved on diskette for future use.

Available for the Commodore 64*

ONLY $24.95
(Satisfaction Guaranteed)

Send Check or Money Order to:

ALSOFT
BOX 164 • CLAIRTON, PA 15025

Reader Service No. 121

*Trademark of Commodore Electronics.

VideoFile, Box 480210, Los Angeles, CA 90048 (phone: 213-655-6795).

SOFTWARE DATABASE

.MENU, the International Software Database, keeps detailed information on over 3000 Commodore-compatible programs, and will help customers locate, evaluate, and order software (through the .Menu/STX Software Transfer Service).

To receive a list of currently available inventory or to order Software, write .MENU Customer Service, 1520 South College Ave., Fort Collins, CO 80524 or call 800-THE-MENU.



CPS-10 is fully serviceable.
READER SERVICE NO. 117

POWER SUPPLY

The CPS-10 improves upon the Commodore power supply with all metal casing, surge-protected outlets, and a one-year warranty. Most significant, the unit is completely serviceable (ever try to repair your Commodore power supply? Break it open sometime). Price is $59.95.

HBH Corporation, 225 West Main St., Collinsville, IL 62234 (phone: 800-448-5819 or 618-344-7912).

RS232 INTERFACE

The *Printmaster/S* hooks up to the Commodore serial bus and provides complete RS232 signals for using only RS232 printer. The interface is switch selectable for 300 through 2400 baud, plus parity, word, and stop bits. A full plus and minus voltage level is provided to insure compatibility.

Omnitronix, Inc., P.O. Box 43, Mercer Island, WA 98040 (phone: 206-236-2983).

COMPUTER CLASSIFIEDS

A monthly newsletter dedicated to swapping software and hardware, *A & S Software's Computer Classifieds* lets advertisers reach 1500 fellow users a month at a rate of 25 cents per word. Subscription is $12.00 per year.

A & S Software, Box 457-AH, Lakeview, MI 48850.

BOOK RELEASES

Five new volumes on the Commodore 128 have been announced by Abacus Software. Scheduled for fall release:

C-128 Internals examines the three computers inside the 128, with ROM listings of BASIC 7.0 and the operating system.

C-128 Trick & Tips combines numerous techniques for 128 programmers.

Artificial Intelligence is an introduction to the use of AI on the C-128 and C-64.

For winter release:

1571 Internals examines Commodore's 128-compatible disk drive, along with ROM listings.

CP/M on the C-128 details the CP/M operating system.

Abacus Software, 2201 Kalamazoo S.E., P.O. Box 7211, Grand Rapids, MI 49510 (phone: 616-241-5510).

COMPUTE!'s VIC 20 and Commodore 64 Tool Kit: Kernal ($16.95) describes the built-in programs that run on each computer.

COMPUTE! Publications, 324 W. Wendover Ave., Suite 200, Greensboro, NC 27408 (phone: 919-275-9809).

TELECOM NEWS

For a $25 initial signup fee and a flat $25 per month, the *PC Pursuit* service of the GTE Telenet Communications Company will allow users in 12 metropolitan areas to make unlimited calls to any computer in those 12 areas. Calls can be placed only during off-peak hours (6 p.m.-7 a.m. weekdays, and from 6 p.m. Friday through 7 a.m. Monday) and are limited to one hour each.

The cities currently serviced are Atlanta, Boston, Chicago, Dallas, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, San Francisco, and Washington, D.C.

To obtain more information, or to register, dial GTE's "In Pursuit Of..." bulletin board at 1-800-835-3001 any hour of the day; or if you prefer to speak to a GTE representative, call 1-800-368-4215 from 8 a.m. to 5 p.m. (eastern time) Monday through Friday.

GTE Telenet Communications Corp., 12490 Sunrise Valley Drive, Reston, VA 22096.

Three medical information services, two concerning women's health and one eye care, have been added to the CompuServe Information Service. These will serve as information exchanges for professionals and information sources for health care consumers.

CompuServe, 5000 Arlington Centre Blvd., P.O. Box 20212, Columbus, OH 43220 (phone: 614-457-8600).

Viewdata Corporation is now offering banks the opportunity to communicate with their customers through their personal computers via the Viewtron network. (For more information on Viewtron, see the review on page 83).

Viewdata Corporation of America, Inc., 1111 Lincoln Road, 7th Floor, Miami Beach, FL 33139 (phone: 305-674-1444).

DATA LOSS PROTECTION

Tripp Lite's Spike Bar, model SK 6-6 ($49.95) will convert a single outlet into six that are completely spike and noise protected. The unit has a six-foot powerline. Their Isobar Plus surge suppressor ($49.95) is available in 4- and 8-outlet versions. Because its components are wired in series instead of parallel, each 2-outler filter bank has double the protection of the previous bank, allowing you to apply varying levels of protection to the components of your computer system.

Tripp Lite, 500 North Orleans, Chicago, IL 60610 (phone: 312-329-1777).

The Pentron Power Surge Protector comes in four models, all providing 2,000,000 watts and 200 joules of spike and surge protection in under 5 nanoseconds.

Pentron Products, Inc., 1560 Trimble Road, San Jose, CA 95131 (phone: 408-946-7500).

COMMODORE IC'S

K. Boufal has available a wide range of integrated circuits for Commodore computers and drives from the VIC 20 through the Amiga. Prices range from $16.50 for a 6510 CPU to $39.95 for a 6567 VIC-II in quantities of 1-9. (Prices are lower for large quantities: order 5,000 6510's, for instance, and the price drops to $7.60 each. Never hurts to have a few extras on hand.)

K. Boufal Consulting Services, 244 Fitswater St., Philadelphia, PA 19147 (phone: 215-925-6469).

MONITORING HARDWARE

An aid to data logging and temperature monitoring, Comp-u-Temp will display 8 or 16 temperature channels. It has a temperature range of −15 to +180 degrees Fahrenheit at approximately 1 degree resolution. The device's electronic interface plugs into the 64's joystick port. Version 1.0 (8 channels) is available for $89.95, version 2.0 (8 channels plus data storage to and from disk) for $109.95, and Version 3.0 (16 channels plus data storage) for $179.95.

Applied Technologies, Inc., Lyndon Way, Kittery, ME 03904 (phone: 207-439-5074).

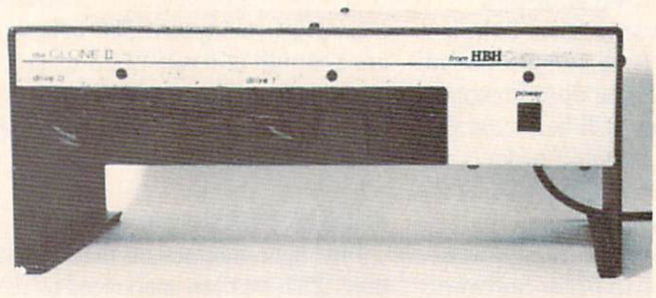
PROGRAM UPDATES

Version 2.1 of *The Whole Bit* ($24.95), Applied Technologies' C-64 word processor, includes a user manual supplied as text files on the program diskette. The user may chain print his own manual, or purchase the program plus 56-page manual for $39.95.

Applied Technologies Inc., Lyndon Way, Kittery, ME 03904 (phone: 207-439-5074).

Grade Manager III has been enhanced to allow teachers to set a range for progress reports (and thereby print reports only for students with averages below a specified point). An error in the Report to Screen program has also been corrected. (Bogus disks will be updated at no charge.)

Smoky Mountain Software, P.O. Box 1710, Brevard, NC 28712 (phone: 704-885-2516).



The Clone II has a 6K buffer, two serial connectors, and a total capacity of 340K. Up to 4 drives can be daisychained. Metal casing has very low heat retention. READER SERVICE NO. 118

CLONE II DUAL DRIVE

The $499 Clone II dual disk drive will allow a Commodore user to format, copy, and verify a new disk in under two minutes. The drive's metal casing, has very low heat retention and will, the manufacturer assures us, keep the Clone from overheating even under continuous operation. The case doubles as a monitor stand.

Included is a utility that will convert incompatible programs to compatible format. The drive carries a one-year warranty.

HBH Corporation, 225 West Main St., Collinsville, IL 62234 (phone: 800-448-5819 or 618-344-7912).

PICK A WINNER

Based on the book by Dick Mitchell, *A Winning Thoroughbred Strategy* ($59.95) allows C-64 users to enter data from the racing form, then computes the statistical order of finish for the contenders. It also determines the win, place, and show probabilities and advises the user how to wager to maximize profits.

Cynthia Publishing Company, Inc., 4455 Los Feliz Blvd., Suite 1106, Los Angeles, CA 90027 (phone: 213-664-3165).

If you can't make it to the track this fall, there's always the office football pool. *Pik'Em '85* ($49.95) promises to help you clean up, having proved 63% accurate versus the spread since 1981. The C-64 program, user-updated with statistics found in the local paper, provides predicted scores for each week of play.

Indeco Consumer Sales, 133-A W. Chapman Ave., Fullerton, CA 92632 (phone: 714-526-1297).

UPDATED PEEK A BYTE

Peek A Byte 64, V2.0 ($35.00) adds a track/sector editor that will read and write up to track 40, as well as do half tracks and read or write sector data with illegal track headers, allowing recovery of data under DOS header errors. Sector data in GCR disk byte format may also be read, edited, and rewritten to the same or a different disk. Included is *The Disk Mechanic,* which will do a fast disk format for a range of tracks or half tracks up to track 40.

Required for use is a 1541 or compatible serial bus drive.

Quantum Software, P.O. Box 12716, Lake Park, FL 33403-0716 (phone: 305-840-0249).

MULTI-PROGRAM DISKS

Three disks offering assorted programs for the C-64 and VIC 20 have been made available by RAK Electronics for $14.95 each plus $2.00 shipping per order: *Games Disk* (64 version, 5 games; VIC version, 16 games, some requiring memory expansion), *Utilities Disk* (6 home utilities on the 64 disk, 11 on the 64), or *Ham Radio Disk* (12 amateur radio application programs).

RAK Electronics, P.O. Box 1585, Orange Park, FL 32067-1585 (phone: 904-264-6777).

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Snap-on computer keyboard! 64K RAM, 20K ROM. Full-size typewriter keyboard. Upper and lower case letters, numerals, symbols, reverse characters. 2 cursor control keys, 4 function keys, programmable to 8. Music synthesizer with 3 independent voices, each with 9 octave range. Input/output ports accommodate . . . user, serial, ROM cartridge, joysticks, external monitor, phone modem.

Built-in disk drive! Intelligent high speed unit with 5¼" floppy disk recorder. 170K formatted data storage; 35 tracks. 16K ROM. Uses single sided, single density disk. Serial interface. Second serial port to chain second drive or printer.

Built-in color monitor! Displays 40 columns x 25 lines of text on 5" screen. High resolution. 320 x 200 pixels. 16 background, character colors.

Built-in ROM cartridge port! Insert ROM program cartridge. Multitude of subjects available in stores across the nation!

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Item H-581-63631-00 Ship, handling: $20.00

THE PRINTER

Print method: Bi-directional impact dot matrix.
Character matrix: 6 x 7 dot matrix.
Characters: Upper and lower case letters, numerals and symbols. All PET graphic characters.
Graphics: 7 vertical dots — maximum 480 columns. Dot addressable.
Character codes: CBM ASCII code.
Print speed: 60 characters per second.
Maximum columns: 80 columns.
Character spacing: 10 characters per inch.
Line feed spacing: 6 lines per inch in character mode or 8 lines per inch selectable. 9 lines per inch in graphics mode.
Line feed speed: 5 lines per second in character mode. 7.5 lines per second in graphics mode.
Paper feed: Friction feed.
Paper width: 4.5" to 8.5" width.
Multiple copies: Original plus maximum of two copies.
Dimensions: 13"W x 8"D x 3¼"H. Wt.: 6½ lbs. **Power:** 120V AC, 60 Hz.

Mfr. List: $200.00

Liquidation Priced At **$118**

Item H-581-63831-00 Ship, handling: $7.00

THE SOFTWARE

"Easy Script" One of the most powerful word processors at any price! Cut re-typing, create documents from standard paragraphs, do personalized letters, see and change a document before it is printed. Instruction manual has extensive training section that simplifies use . . . even for someone who has never used a computer or word processor before!

"The Manager" A sophisticated database manager for business or home use. Business uses: accounts payable/receivable, inventory, appointments, task manager. Home uses: mailing lists, home inventory, recipes, collection organizer, investment tracking, checkbook balancing. School uses: research article index, gradebook.

Mfr. List: $73.98

Liquidation Price **$24**

Item H-581-64011-03 Ship, handling: $3.00

BUY INDIVIDUAL UNITS OR GET THIS ULTRA-FAMOUS SYSTEM AT ONE LOW PACKAGE PRICE!

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Item H-581-63622-01 S/H: $6.00 pr.

64 MODEM

Mfr. List: $124.95

Liquidation Price **$44**

Item H-581-63646-00 S/H: $4.00

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MASTERTR

ARCADE-STRATEGY-ACTION

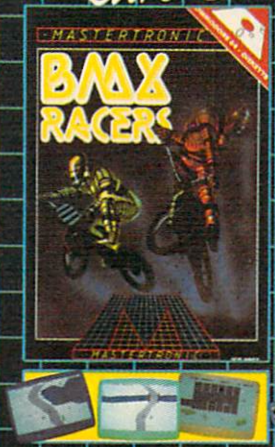
Sure Chart Winners



One of the most faithful computer simulations ever produced of a fruit machine. It incorporates the hold, nudge, gamble and shuffle features found in the real thing.



A satellite retrieval game that includes 16 levels of "low pressure" death awaiting the unskilled astronaut.



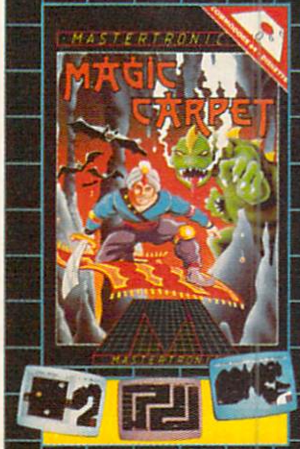
A sure chart winner. You will need skill and fast reflexes to beat this one! You can ride on 5 different courses, each course ranges from 8 to 25 different scrolling screens.



Opened to Five Star Reviews in Europe recently this is surely one of the most challenging and unusual games available for the C64. Written by "Commodore Programmers of the Year" Richard and David Darling. The game has five different spectacular screens with hidden twists — if you get this far you have to retrace your steps through another five of increasing difficulty.



Another unusual arcade — strategy game in which the players strive by weird and wonderful techniques to achieve a state of miniaturisation and hence enter Zyco's brain and the game continues in another dimension.



An imaginative three screen multi level arcade adventure that uses very high resolution graphics and will test the abilities of the most experienced games players.



A scrolling multi screen game that takes Commodore graphics to a 'new' state of the art level previously seen only in a handful of other games. Playability is a keyword on this 'five star game'!



A one or two player game with split screen scrolling graphics that realistically simulates off road riding on eight different and challenging courses.



Multi screen arcade action with real twists needing a steady hand and a bold strategic game play. It will keep your interest alive for hours.



Neat variation on a city bomber theme using excellent scrolling graphic routines that is extremely addictive.

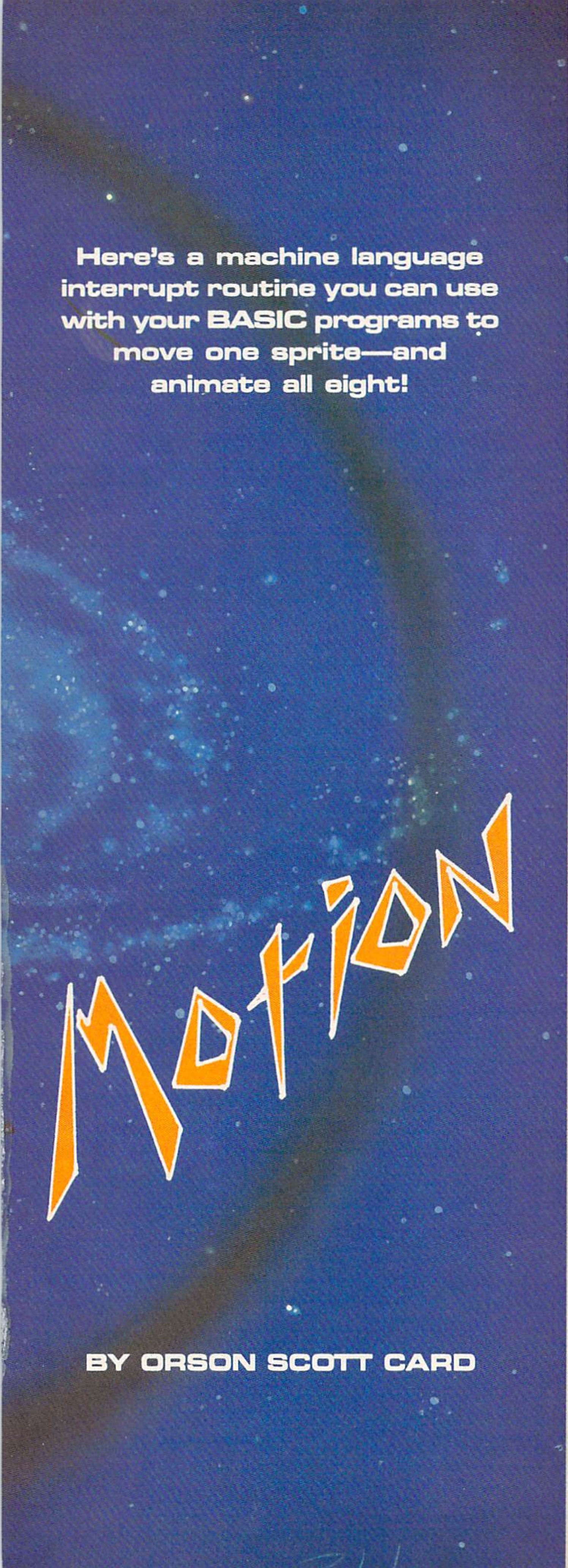
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$9.99

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ONIC!
BRINGS YOU BRAND NEW
UNBELIEVABLE
COMMODORE 64 DISKS
ADVENTURE
Expand the Horizons of your Mind
EDUCATIONAL
Learning is Fun
MASTERTRONIC
DARK STAR
An absorbing multi level, multi screen game that uses excellent scrolling screen graphics. It requires not only fast reactions but good memory recall.
The Quest for the Holy Grail
Britains zany Monty Python team immortalised in a classic adventure game that is rude irreverent, and often very funny. The challenge could drive you banana's!
SE-KAA OF ASSIAH
Master Vision
An amazing two program adventure using over 100K of memory that will challenge the most experienced adventure games players. Myriad locations graphically illustrated with thousands of alternative moves will probe the limits of your mind.
COUNT With Oliver
A two program disc aimed at 4-7 year old children that introduces the basics of counting, and simple addition and subtraction. At the same time the child is both amused and entertained by the fun aspects of the programs.
LOOK SHARP
These two testing programs were written by college principal Gordon Askew and help to sharpen observational skills and visual memory. Each of the two programs contains three games and are aimed at 4-7 year olds and then from 7 years upwards. The screen graphics and entertainment value guarantee a childs interest and pleasure.
STARACE
'Star Wars' 1985 style with a very fast moving five screen arcade action game with multi skill levels.
MASTER ADVENTURER
BLACK CRYSTAL
A six programme adventure with 180K of memory
A six program adventure in the Third Continent magical fantasy series using over 180K memory could absorb and expand your imagination for months.
THE WRATH OF MAGRA
Truly 'State of Art' programming in this latest Third Continent adventure. Launched to rave reviews in England. This is a 120K adventure in three programs that comes with a beautifully illustrated 158 page descriptive 'book of shadows' set not to be missed by serious games players.
Make Music with MASTERTRONIC
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Interrupting Your Way to Fast



Here's a machine language interrupt routine you can use with your BASIC programs to move one sprite—and animate all eight!

BY ORSON SCOTT CARD

CREATING YOUR OWN GAMES ON THE VIC AND 64

During the 16 months this column has appeard, we've run into the same problem time and again: BASIC is a fast language, but not fast enough for arcade-quality game programming.

There are simply too many jobs to do all at once. Moving the player-figure, animating sprites and characters, checking for collisions, keeping score, playing music—methodically, patiently, BASIC does the job.

Meanwhile, the player breaks the joystick to get the program to respond.

We've tried various tricks to get around the problem. By putting custom characters in strings and PRINTing them on the screen, we've achieved fast movement. By using sprites we've achieved smooth, animated movement.

Now it's time for the transition to real machine language speed. In the last two months, we've gone through all the steps necessary to create, animate, and move sprites. Now we're going to use BASIC to set up a machine language routine that will animate all eight sprites and move sprite 0 in response to either the joystick or the keyboard. Yet the machine language will happen in the background, so that BASIC can still respond to and control the major events on the screen.

INTERRUPTS—THE "BACKGROUND MODE"

Most of the Commodore 64's housekeeping work is done in the background. Sixty times a second, the internal timers cause an interrupt (IRQ), a signal to the central processing unit to drop what it's doing, take care of some chores, and then go back to its main business—your program.

What chores does it do? It blinks the cursor, checks the STOP key, scans the keyboard. It's tedious work, but somebody has to do it.

In the middle of all its chores, though, the interrupt routine does something wonderful. It finishes up one job and then jumps to whatever address is pointed to by locations 788 and 789. (788 contains the low byte of the address; 789 contains the high byte, or page number.)

A memory location that points to another memory location is called a *vector.* Vectors are used by the machine language instruction called JMP, or "jump." This is the machine language equivalent of GOTO, only instead of jumping to a line number, the computer JMPs to a memory address and starts executing whatever commands it finds there.

Vectors are used by the *indirect* form of JMP. In the direct mode, JMP 788 would tell the computer to go to location 788 and carry out whatever command is found there. In indirect mode, however, JMP (788) tells the computer to go *look* at location 788 (and the next byte),

JAMES REGAN



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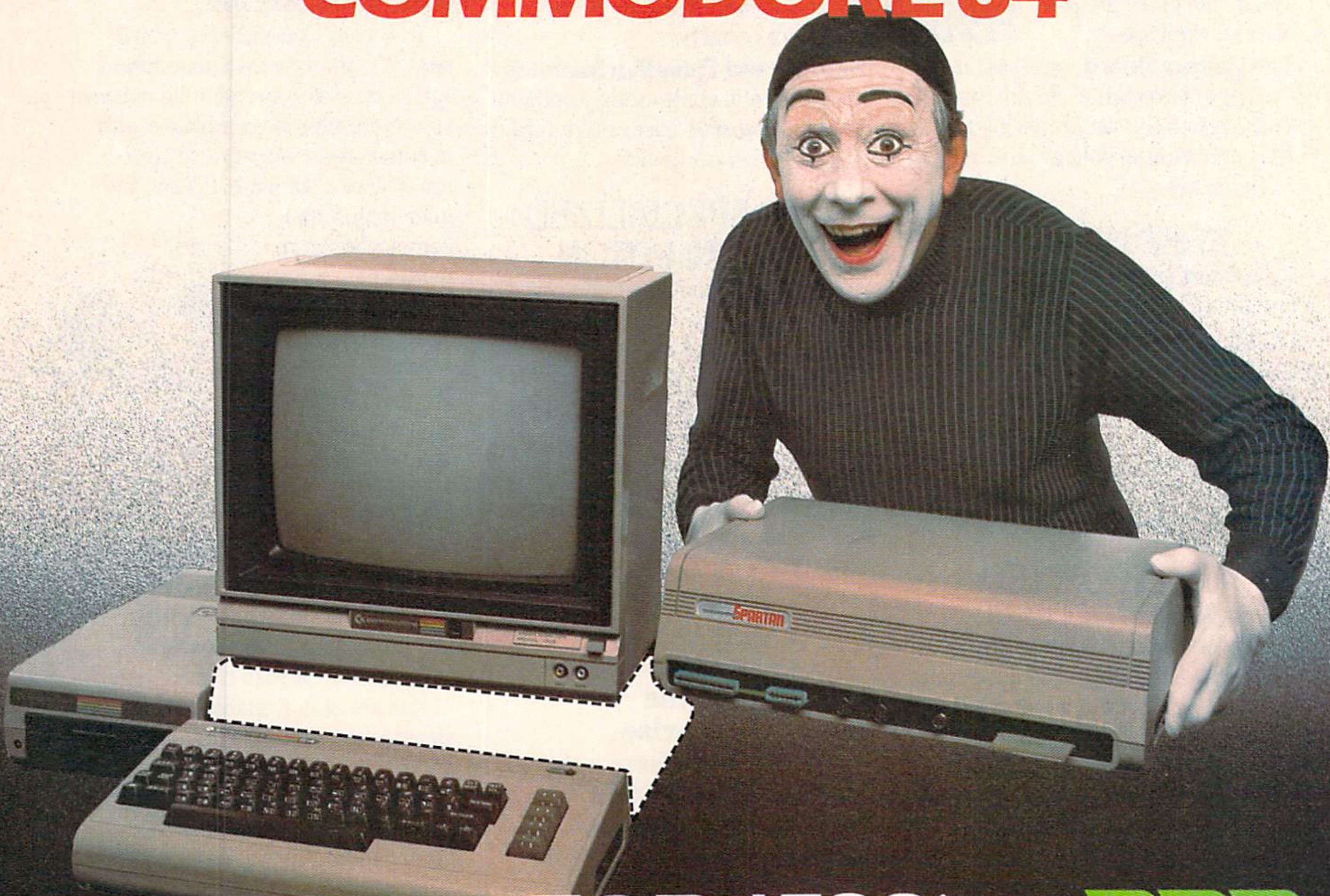
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find what two-byte address is contained there, and then jump *to the second address.* The vector "points to" the address where the program must go.

Normally, the vector at 788 and 789 points to the ROM routine at 59953. The low byte (stored at 788) is 49; the high byte (stored at 789) is 234.

But you can change that vector to point to any other location in the computer. For instance, suppose you put a short machine language routine at location 5000. All you have to do is change 788 to point to the low byte of that address, and change 789 to point to the high byte.

Once the vector is changed, your machine language routine will be carried every 1/60th of a second.

Your machine language routine should end with a jump (JMP) to 59953, so that the operating system can take care of the rest of its business. (Since you can't count on every Commodore 64 always working the same way, the best practice is to save the original vector address somewhere else, and then end your program with a JMP through that saved vector, instead of a direct JMP to 59953. That way if a future version of the 64 points to a different address, your routine will still work.)

With your interrupt routine in place, your job gets carried out by the computer along with its other housekeeping chores. Just as the housekeeping is invisible to the main program, so is your machine language routine. That means you could have two programs going on at once: your main program–BASIC or machine language–going on in the foreground, while other jobs were going on in the interrupts.

DON'T POKE THE VECTOR

You can READ your machine language program from DATA statements, POKE it into memory, then change the vector at 788 and 789 to point to your routine. Unfortunately, you can't change the vector from BASIC. That's because changing it takes two POKEs, one for each byte. It is possible that the interrupt will take place *between* the two POKEs. If it did, the computer would try to JMP through a vector that contained half of two addresses–the low byte of yours, say, and the page number of the regular vector. In this case, two halves don't make a whole. The computer will unquestioningly jump to this unplanned address, and chances are very good it will not find a meaningful program there. When a computer tries to execute garbage, ugly things happen. You usually end up turning off the computer and starting over.

So you can't use POKEs to change the vector. Instead, you have to use a short machine language routine to do the job.

And even then, your ML routine has to *turn off* interrupts using the SEI command, because if it didn't, the interrupt could still come in the middle of the operation. After the SEI, however, the interrupt can't happen. Your ML routine can safely change the vector, and then allow interrupts again using the CLI instruction. As soon as interrupts are enabled again, the interrupt routine will start to function.

A SIMPLE INTERRUPT ROUTINE

So you can see how it works, an example is provided on page 123. The short BASIC program *Border Interrupt* sets up an 11-byte interrupt program at location 5000, and a 13-byte setup program at 5011.

Line 10 READs and POKEs the data for the setup routine; line 20 READs and POKEs the data for the interrupt routine. Then line 30 tells BASIC to go execute a machine language subroutine at address 5011. When the subroutine ends, line 40 ends the program. Type in lines 10, 20, 30, 40, 50, and 60 (don't bother typing in REM lines). Then RUN the program.

Almost immediately, the BASIC program will end. You'll see the READY prompt, and you can move the cursor around just like always. You could even write another program (as long as it didn't reach location 5000!), and it wouldn't make any difference. The reason is that the *Border Interrupt* program is chugging away in the background.

And what is it doing? Something utterly useless, but kind of fun. The interrupt program looks at the first location in screen memory (the upper left hand corner of the screen, at location 1024). Then it POKEs the low four bits into the border color register that is located in line 53280.

In other words, whatever character is located in the

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upper lefthand corner of the screen will determine the border color.

To test it, press HOME and then any key on the keyboard. Try it several times, with several different keys. Typing the letters "@ABCDEFGHIJKLMNO" in order (press HOME or CURSOR-LEFT each time, of course) will cause the border to display all 16 colors in succession.

This routine is, of course, absolutely useless. But it has the virtue of being short—so I can easily explain what's going on in each part of it.

Let's look first at lines 48 through 50. Line 50 contains the actual DATA statements, but line 49 gives the assembly language mnemonics, and line 48 explains what's happening.

The SEI instruction (120) disables interrupts. Then the LDA instruction (immediate mode) picks up the number 136—the low byte of address 5000—and stores it (using the STA instruction) at location 788 (low byte 20, page number 3). This is the equivalent of POKE 788, 136. Then LDA picks up the number 19 (the high byte, or page number, of address 5000) and STAs it at 789. The vector is now changed. Then the CLI instruction enables the IRQ interrupt to take place again. Since the job is done, the RTS instruction (ReTurn from Subroutine) takes us back to the BASIC program, beginning at the next line after the SYS command.

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—*Harvey Bernstein, Antic Magazine, Feb. 1985*

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—*Helen Garret, Apple-Dayton Journal, March 1985*

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—*Christian Basler, NY Commodore Users Group Review, Sept. 1984*



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Now let's look at lines 58 through 60. This is the interrupt routine. When the computer, during its housekeeping, JMPs through the vector at 788, it now goes directly to location 5000, where this routine begins. The first instruction picks up whatever value is found at location 1024, the first byte of screen memory (LDA followed by the low byte, 0, and the page number, 4, of location 1024). The AND#15 operation erases all the bits of that number except bits 0, 1, 2, and 3. The result is that the computer is now holding a number that must be less than 16. Then STA 53280 (low byte 32, page number 208) stores (or "POKEs") that value into the border color control register. Finally, JMP 59953 sends the computer on to do the regular housekeeping. (Notice that this is the *direct* JMP instruction—go directly to this address, without using a vector.)

To end this interrupt routine, press RUN/STOP-RESTORE. This sets the vector back to its original values.

EXCHANGING MESSAGES

Changing the border color by typing different letters in the upper lefthand corner of the screen is amusing for about 20 seconds. But try this anyway: Once the interrupt is in place and running, type in this BASIC line in direct mode.

```
FOR I=0 TO 15:POKE 1024,I:FOR X=0 TO 9
9:NEXT:NEXT
```

Obviously, the X loop is there for timing—change the number 99 to something else to slow the miniprogram down or speed it up. The BASIC program is, in effect, passing information to the interrupt routine.

There are many ways that the interrupt routine can, in turn, pass information to BASIC. The method I like best is the one used by the main program this month, *Starship* (see page 126). The interrupt-driven machine language routine puts crucial information directly into BASIC variables. Then the BASIC program has merely to check those variables: IF QQ=1 THEN QQ=0:GOSUB 9000 would be a good way of using the information. The line checks to see if QQ is 1; if it is, it immediately sets QQ back to 0, then goes and does whatever should happen as a result. The interrupt routine might use QQ to tell the BASIC program that there has been a sprite-sprite collision, or a sprite-foreground collision, or the direction that sprite 0 is moving.

Of course, this requires the interrupt routine to actively pass back information. BASIC could find things out by using the PEEK command to look directly at locations where the interrupt routine is storing data. What matters is that, in effect, BASIC and the interrupt routine are talking to each other—and yet both are able to act at the same time, without one having to wait for the other to finish in order to take its turn.

TIME LIMITS AND DAISY CHAINS

Unfortunately, the entire interrupt routine has to take place in far less than 1/60th of a second. You can do a

lot in that amount of time, of course, because machine language thinks of a second the way human beings think of a week. But you can't do *everything.*

Besides, if your interrupt routine is too long, it will end up slowing down the main program after all. Interrupt time is stolen from main program time, and the more you put in interrupts, the less time there is for the main program, so the longer the main program will take to carry out its tasks.

Since our interrupt routines are going to control animation and movement, we don't want everything to happen 60 times a second anyway. That's *too* fast—the player couldn't possibly see or control what was happening in a game that moved that fast.

The solution to this is to write *several* machine language interrupt routines. Only one of them executes with each interrupt. But each routine changes the vector at 788 and 789 to point to the next routine; the last one points to the first one again. That way they make a sort of daisy chain, each program setting up the vector so that the next one will be executed the next time around.

Starship uses this pattern. The vector always points to the Animation Timer Routine. This routine simply counts down to see whether it's time to switch to the next animation step. If it is, the program JMPs to the Animation Routine, which changes the shapes of all the sprites and then JMPs back to the housekeeping routines.

If it isn't time for animation, then the program JMPs through the Player Vector to one of the Player Control Routines. This is not the interrupt vector at 788 and 789—it's a special vector at 37888 and 37889 used only by the Player Control Routines. It determines which routine will be executed when the Animation Timer passes control on to a Player Control Routine.

Usually, the Player Vector points to the Player Timer. It checks to see whether it's time for another player movement. If it isn't, the program JMPs to housekeeping.

If it is time for player movement, the Player Timer changes the Player Vector to point to either the Read Joystick or Read Keyboard routine (you select from BASIC which will be used before starting the interrupt). The Read routines will, in turn, set the Player Vector to point to the Movement Routine. The Movement Routine sets the vector to point to the Collision Routine. And the Collision Routine sets the vector to point back to the Player Timer, which again counts down.

This means that the interrupt will be executing different routines every time. It always begins with the Animation Timer, which then routes the computer to one of five different routines: Animation, Player Timer, Read (either Read Joystick or Read Keyboard), Movement, and Collision.

If Animation is carried out every 6th interrupt (once every 1/10th second), then the whole movement cycle can be as fast as once every 1/12th second. BASIC just isn't going to be able to match that. Yet the routines leave enough time for the BASIC program to do its own work. While the interrupt routines control the movement of sprite 0 and the animation of sprites 1 through 7, the *movement* of sprites 1-7 is left up to BASIC. Also, BASIC is required to respond to collisions—the only response the interrupt routines will make is to bounce back from collisions, and then only if the Bounce Flags were set from BASIC.

WHAT THE PROGRAM DOES

Now that you know the principles of interrupt-driven machine language programming, you can make use of the program *Starship.* If you know nothing at all about machine language, just type in the program and study the BASIC REM lines to see what changes you can control by changing BASIC lines.

For instance, you can set the Bounce Flags, to determine whether the player-figure will rebound from collisions with other sprites or with the foreground.

You can set the Animation Speed—how quickly the sprites cycle from shape to shape. A value of 1 is the fastest, causing the shapes to change with every interrupt—but it also makes it so that player-movement never happens at all. To allow player movement, select a value of 2 or greater. A value of 4 will cause the animation to happen every 1/15th second—just about the speed used by movies.

With Movement Speed (how fast sprite 0 moves across the screen), a value of 1 is the fastest possible—but *how* fast that is depends on the Animation Speed. The slow-

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er the Animation Speed, the faster each possible Movement Speed will be. So the best thing to do is choose the Animation Speed you like and then fiddle with the Movement Speed.

The Vertical Movement Increment and Horizontal Movement Increment decide how *far* sprite 0 will move with each step. A vertical or horizontal value of 1 causes the sprite to move one pixel at a time. Higher numbers mean bigger jumps. A value of 0 in either vertical or horizontal direction means that the sprite will not move at all in that direction. This allows you to have movement take place in one plane, by allowing only vertical or only horizontal movement.

You can also set colors and starting positions.

Sprite 0 is controlled by a joystick in port 2. This program passes information back to BASIC using seven variables. The integers C0%-C6% must be the second-through-eight variables declared in the program. (The first variable, a string, is left for the second routine we did a few months ago.) BASIC can read and respond to these variables as follows: C0%=1 (firebutton is pressed); C1%=*n* (if >0 sprite *n* just hit edge of the screen); C2% and C3% report the most recent collision register readings; C4%=1 (player is calling for sprite 0 move); C5% and C6% report whether sprite 0 is bouncing off sprites or foreground (this is necessary because these collisions won't be reported in C2% and C3%). In addition, the ninth variable declared, SP%, works in the other direction. If you want to move another sprite, set SP% to a number between 1 and 7; then SYS 38336. This causes sprite SP% to move in the direction called for in the SPRITE JOYDIR TABLE at 37963. The odd-numbered bytes from 37963 to 37977 can be loaded with a direction (1=up, 2=down, 4=left, 8=right–add for diagonals). Margins are set individually for each sprite in locations 37978-38009. The machine language routine at 38336 lets your BASIC program use the same movement routine that moves sprite 0 during the interrupts.

You can also change the shapes of the sprites, so that this starship-and-planets scenario could as easily be Dorothy and various other characters from the Wizard of Oz, or a sailing ship and various obstacles in the sea, and so on. You can redefine the character set to allow character graphics (though this program does not do so), and make many other changes, as long as you don't interfere with the sections of memory used by the machine language program.

USE OF MEMORY

This program–like all the sprite programs in this column's last two months–reserves the 8K from 32768 to 40959 for video memory. Screen memory is placed at 32768, which means that the sprite shape table is at 33784-33791. However, you won't ever have to deal with that shape table directly–the interrupt routine handles it for you.

Sprite shapes are stored from 33792 to 36863. The first 512-byte block holds the 8 patterns for sprite 0. These can either be an animation sequence or, as *Starship* has it, 8 shapes representing the same object, seen from above, facing in eight different directions. The Player Animation Flag, which you set from BASIC, determines which way the eight sprite-0 shape blocks will be used. If it is set to 1, sprite 0 is not animated, but faces in the direction it is moving. If it is set to 0, sprite 0 is animated just like the other sprites, but faces the same way regardless of how it is moving.

Starting at 34304, 34816, 35328, 35840, and 36352 are five more 512-byte blocks, each of which can contain up to eight sprite shapes. (Remember that each sprite shape block consists of 64 bytes, of which 63 are scanned by the VIC-II chip to determine the sprite shape. Even if the sprite is very small, all the bytes are still scanned, so every sprite shape must begin at a memory address evenly divisible by 64.) This program uses only two of these animation sequences. Sprites 1 and 3 both use the same animated sequence starting at 34304; sprites 2 and 4 use the sequence starting at 34816.

However, you don't have to use 8-shape sequences. You could just as easily have two- or four-shape sequences. This is because the interrupt routines look at the Sprite Animation Tables starting at 38080 to find out the sprite shapes to use for the different sprites. Each sprite, from 0 to 7, has an eight-byte table. Sprite 0's table is at 38080, sprite 1's at 38088, sprite 2's at 38096, and so on. Each time through the animation sequence, the Animation Rou-

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tine looks at the next byte in the block. For instance, at animation step 0, the Animation Routine looks at 38088+0 to find the code for sprite 1's shape, and 38096+0 to find the code for sprite 2's shape. At animation step 1, it checks 38088+1 and 38096+1, and so on. After step 7, it starts over again at step 0.

And what code numbers are placed in those tables? The sprite shape block numbers. You'll remember from last month and the month before that the video block is divided into 256 sprite shape blocks, numbered from 0 to 255. The sprite 0 shape blocks, at 33792, 33856, 33920, 33984, 34048, 34112, 34176, and 34240, are sprite shape blocks 16, 17, 18, 19, 20, 21, 22, and 23. The five 8-block animation sequences start at codes 24 (34304), 32 (34816), 40 (35328), 48 (35840), and 56 (36532). (Remember that the video block begins at 32768, so that block 0 is at that address.)

Now, any one of the eight sprites can call on any of these sprite animation sequences in its Sprite Animation Table. In *Starship*, sprites 1 and 3 use the same animation sequence, the one with codes 24-31. However, so that they aren't doing the same thing at the same time, sprite 1's table contains the values 24-31 in order, while sprite 3's table goes 27, 26, 25, 24, 31, 30, 29, 28. The animation will still proceed smoothly, but the sprite 3's planet will seem to rotate in the opposite direction from sprite 1's planet.

If you wanted to, however, you could give each sprite a four-step animation sequence by repeating: for instance, you might fill the Sprite 1 Animation Table with the codes 32, 33, 34, 35, 32, 33, 34, 35. Then, as the Animation Routine cycled through its eight steps, it would simply repeat the same four-step sequence twice. A two-step sequence would have a table like this: 32, 33, 32, 33, 32, 33, 32, 33. This gives you great freedom to devise many different animated sprites. Animating all eight sprites takes no more time than animating none. (Remember, though, that except for sprite 0, all the other sprites' movement from place to place on the screen is controlled by the BASIC program, and will be slower the more sprites you try to move around at once.)

The 1K of memory from 36864 to 37888 is reserved for a custom character set. *Starship* doesn't use one, but your program might. If you use the ROM set, as *Starship* does, the VIC-II chip sees the character set from 36864 to 40959. But the computer itself, the 6510 chip, doesn't

CARD OPCODES TABLE 1

MNEMONICS WITH ONLY ONE OPCODE

CONDITIONAL BRANCHING COMMANDS

Followed by one-byte relative address:
step forward 1 to 127 steps or backward (256-) 1 to 128 steps

BCC	144	branch if carry is clear (addition DID NOT carry or subtraction DID borrow)
BCS	176	branch if carry is set (addition DID carry or subtraction DID NOT borrow)
BEQ	240	branch if result is = or 0
BMI	48	branch if result is "minus" (128-255)
BNE	208	branch if result is = or not 0
BPL	16	branch if result is "plus" (1-127)
BVC	80	branch if overflow is clear
BVS	112	branch if overflow is set

UNCONDITIONAL BRANCH

JSR	32	Jump to subroutine at absolute (two-byte) address:

ONE-BYTE COMMANDS

BRK	0	break
CLC	24	clear carry flag (do before two-byte addition)
CLD	216	clear decimal mode
CLI	88	clear interrupt disable bit (allow interrupts)
CLV	184	clear overflow flag
DEX	202	decrement X register (X−1)
DEY	136	decrement Y register (Y−1)
INX	232	increment X register (X+1)
INY	200	increment Y register (Y+1)
NOP	234	do nothing for one machine cycle
PHA	72	push accumulator contents onto stack
PHP	8	push processor status (all flags) onto stack
PLA	104	pull accumulator value from stack
PLP	40	pull processor status (all flags) from stack
RTI	64	return from interrupt (to address saved on stack)
RTS	96	return from subroutine (to address saved on stack)
SEC	6	set carry flag (do before two-byte subtraction)
SED	248	set decimal mode
SEI	120	set interrupt disable status (block interrupts)
TAX	170	transfer accumulator to X register
TAY	168	transfer accumulator to Y register
TSX	186	transfer stack pointer to X register
TXA	138	transfer X register to accumulator
TXS	154	transfer X register stack pointer
TYA	152	transfer Y register to accumulator

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see the character set. So after that first 1K block, all the machine language routines and the tables and vectors used by them are in RAM "under" the Character ROM. (The interrupt routine in the simple example program above was also under the locations where the VIC-II sees the character ROM in the normal video block.) BASIC can't touch these routines, and they won't disturb the VIC-II chip, either.

The vectors and tables begin at 37888. The machine language routines begin at 38144. You can play around with video memory all you like, as long as you don't wipe out these crucial areas.

AND FOR YOU MACHINE LANGUAGE USERS...

If you know or are learning machine language, I've thoroughly REMarked the machine language routines so that you can follow exactly what's going on, almost as well as if you were reading ML source code. I've always hated typing in those endless meaningless DATA statements in long machine language programs, with never a hint as to what is going on. So I'm trying to do a bit better for you. Just remember that the REM lines are there only to help explain things. Don't bother typing them in; your program will take up a lot less memory and run a bit faster if you leave them out.

If you want to tinker with the machine language directly, right in the DATA statements, you may find the Machine Language OpCodes Table helpful. It lists all the assembly language mnemonics and then lists the *decimal* opcode for each of that command's modes—implied, accumulator, immediate, zero page, absolute, indirect, and/or indexed.

Be careful! This program disables the RUN/STOP-RESTORE keys. If you make a mistake typing in the machine language, the program will almost certainly hang up the computer, and the only way out is to turn off the machine and start over. So please, please SAVE a copy of the program before you ever RUN it.

WHAT ABOUT THE FUTURE?

In the 17 issues of *Ahoy!* that have contained articles in this series, we have covered all the graphics and sound features of the VIC 20 and Commodore 64 that are useful in BASIC game programming. (Some features, like the bit map, simply cannot be used effectively from BASIC.) Now, that doesn't mean we've covered all there is to know about game programming. We haven't dipped much below the surface there. But the machine-specific programming techniques have been pretty well covered.

So—where do we go from here? There are several possibilities. I could go on and explore the possibilities of

CARD OPCODES TABLE 2

MNEMONICS WITH SEVERAL ADDRESSING MODES

MNEMONICS AND OPCODES

Mode:	immed	Zpage	Zpg,X	AbsoL	Abs,X	Abs,Y	(Ind,X)	(Ind),Y	accum
ADC	105	101	117	109	125	121	97	113	"
AND	41	37	53	45	61	57	33	49	"
ASL	"	6	22	14	30	"	"	"	10
BIT	"	36	"	44	"	"	"	"	"
CMP	201	197	213	205	221	217	193	209	"
CPX	224	228	"	236	"	"	"	"	"
CPY	192	196	"	204	"	"	"	"	"
DEC	"	198	214	206	222	"	"	"	"
EOR	73	69	85	77	93	89	65	81	"
INC	"	230	246	238	254	"	"	"	"
JMP	"	"	"	76	"	"	108*	"	"
LDA	169	165	181	173	189	185	161	177	"
LDX	162	166	182**	174	"	190	"	"	"
LDY	160	164	180	172	188	"	"	"	"
LSR	"	70	86	78	94	"	"	"	74
ORA	9	5	21	13	29	25	1	17	"
ROL	"	38	54	46	62	"	"	"	42
ROR	"	102	118	110	126	"	"	"	106
SBC	233	229	245	237	253	249	225	241	"
STA	"	133	149	141	157	153	129	145	"
STX	"	134	150**	142	"	"	"	"	"
STY	"	132	148	140	"	"	"	"	"

*The JMP command's indirect mode has no offset: JMP (vector)
**LDX and STX, in zero-page indexed mode, are offset by Y, not X

DESCRIPTION OF OPERATION

MNEMONIC	operation performed
ADC	add value in accumulator with value at:
AND	logical AND accumulator bits with bits at: (clears all bits not "on" at both locations)
ASL	shift left all bits at:
BIT	test accumulator against bits at:
CMP	compare accumulator with value at: (subtraction sets flags without changing accumulator)
CPX	compare X register with value at:
CPY	compare Y register with value at:
DEC	decrement value at:
EOR	exclusive-OR accumulator bits with bits at: (clears all bits "on" or "off" at *both* locations; sets all bits "on" at only one location)
INC	increment value at:
JMP	jump to location:
LDA	load accumulator from:
LDX	load X register from:
LDY	load Y register from:
LSR	shift right all bits at:
ORA	logical OR accumulator bits with bits at: (sets all bits "on" at either location)
ROL	rotate left all bits at:
ROR	rotate right all bits at:
SBC	subtract value at ____ from value in accumulator
STA	take accumulator value and store it at:
STX	take X register value and store it at:
STY	take Y register value and store it at:

DESCRIPTION OF MODES

Mode (number of bytes following opcode): how following bytes are interpreted

Immediate (1): use next byte as value in operation
Zero page (1): get value from this one-byte zero-page address
Zero page,X (1): add next byte and X contents and get value from combined zero-page address
Absolute,X (2): get value from this two-byte address
Absolute,Y (2): add next two bytes and X contents and get value from combined address
Absolute, Y (2): add next two bytes and Y contents and get value from combined address
(Indirect,X) (1): add next byte and X contents, go to combined zero- page address, and use contents of that location (low byte) and next location (page number) as address where value to be operated on is found
(Indirect),Y (1): go to one-byte zero-page address; add Y contents to contents of that location (low byte) and next location (page number), and use combined address as vector to location where value to be operated on is found
Accumulator (0): get value from accumulator



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the much better BASIC in the C-128. I could use the Amiga as the centerpiece machine in articles about games. We could step away from arcade-style games for a while and play around with word games, puzzles, adventure games. What would you like to do? Of course, some decisions may already have been made by the time you read this column. But we really would like to know what you want in the future. I, for one, would much rather talk about something you want to learn about than go off into areas that don't interest you. And the good folks at *Ahoy!* have this crazy notion that if the magazine contains articles you want to read, they'll sell more copies. You have only to ask, and we will do our best to comply. (If, however, you would prefer to see no articles by me *at all*, then you may keep your opinions to yourself.)

And a bit of sad news. I'm retiring my VIC 20. I've done all that I can do with the unexpanded 5K machine; to do anything more would require far more resourcefulness and time than I have been able to discover in my admittedly lazy soul. If you VIC owners feel betrayed by this decision, please realize that you have been avenged in advance: I also own a PCjr, in which I have invested many thousands of dollars, while you couldn't possibly have invested more than $500 in your VIC even if you gold-plated it. I mean, if you want to see a loser...☐

SEE PROGRAM LISTING ON PAGE 125

STARSHIP Memory Use

Page 148: Vectors, Flags, Timers, and Tables

address	low byte (148 is high byte)	FUNCTION
37888-9	00	point to ORIGINAL HOUSEKEEPING VECTOR
37890-1	02	address of READ STICK
37892-3	04	address of INTERRUPT MOVEMENT HANDLER
37894-5	06	not used
37896-7	08	address of MOVE COUNT
37898-9	10	point to MOVE ROUTINE (either MOVE COUNT or INTERR.MOVE.HNDL)
37900-1	12	point to WRAPUP (exit point for all)
37902-37919		reserved for future vectors/addresses
37920	32	ANIM TIMER (execute animation?)
37921	33	SET ANIM TIMER (reset value for ANIM TIMER)
37922	34	ANIM COUNT (where are we in sequence?)
37923	35	SPRITE 0 ANIMATION FLAG (1=animate spr 0; 0=directionalize)
37924	36	TIMER (execute move?)
37925	37	SET TIMER (reset value for TIMER; 1=fastest)
37926	38	SET GO (reset value for GO-SPEED)
37927	39	FIREFLAG (1=fire button pressed)
37928	40	GO-SPEED (how many sprite 0 moves per interrupt? 1=slowest)
37929	41	BOUNCING/SPRITE (sprite 0 is bouncing off this sprite)
37930	42	BOUNCING/FOREGROUND (sprite 0 is bouncing off foreground)
37931-37932		RESERVED
37933	45	PLAYWORK (used by READ routine)
37934		RESERVED
37935	47	MOVING (player is trying to move)
37936	48	WRAPFLAG (1=wraparound; 0=stop at edge)
37937	49	COLLISION/SPRITE (general sprite/sprite coll.)
37938	50	COLLISION/FIELD (general sprite/playfield coll.)
37939	51	RESERVED
37940	52	BOUNCE-S (1=sprite 0 rebounds from sprite collisions)
37941	53	BOUNCE-F (1=sprite 0 rebounds from foreground collisions)
37942	54	RESERVED
37943	55	EDGEHIT! (tells BASIC number of sprite that hit edge)
37944-51	56-63	LOCATION REGISTER OFFSET TABLE (:0,2,4,6,8,10,12,14) (use SPRITE NUMBER to index into this table)
37952-61	64-73	SPRITE 0 DIRECTION TABLE (:16,20,0,22,23,21,0,18,17,19) (indexed by JOYDIR as if 37951 were base)
37962-76	74+even	SPRITE BITMASK TABLE (:1,2,4,8,16,32,64,128) (indexed by LOC REG OFFSET to get horizontal bitmasks)
37963-77	75+odd	SPRITE JOYDIR TABLE (indexed by LOC REG OFFSET) (direction of movement 1=up + 2=down + 4=left + 8=right)
37978-92	90+even	TOP EDGES (indexed by LOC REG OFFSET) (set to top edge of screen for each sprite in order)
37979-93	91+odd	BOTTOM EDGES (indexed by LOC REG OFFSET)
37994-38008	106+even	LEFT EDGES (indexed by LOC REG OFFSET)
37995-38009	107+odd	RIGHT EDGES (indexed by LOC REG OFFSET)
38010-66	122–178	available for your routines

Pages 149-159: Machine Language Routines

addr.	(low,pg.)	ROUTINE (loaded at BASIC line number)
38067	(179,148)	INITIAL SYS ROUTINE (2000)
38144	(0,149)	ANIMATION SHELL (2020)
38272	(128,149)	MOVEMENT COUNTER (2050)
38314	(170,149)	BITSET (set horizontal high bit; 2060)
38324	(180,149)	BITCLEAR (2070)
38336	(192,149)	BASIC MOVEMENT HANDLER (2400)
38391	(247,149)	REPORT NON-0 WRAPS (2470)
38400	(0,150)	XMOVE (2100)
38528	(128,150)	UPMOVE (2140)
38592	(192,150)	DOWNMOVE (2160)
38656	(0,151)	LEFTMOVE/HI-BIT SET (2180)
38720	(64,151)	LEFTMOVE/HI-BIT CLEAR (2200)
38784	(128,151)	RIGHTMOVE/HI-BIT SET (2220)
38848	(192,151)	RIGHTMOVE/HI-BIT CLEAR (2240)
38912	(0,152)	READ JOYSTICK and MOVE ONCE (2500)
38976	(64,152)	INTERRUPT MOVEMENT HANDLER (2530)
39040	(128,152)	SET SHAPE 0 (2550)
39072	(160,152)	COLLISION CHECK for sprite 0 (2270)
39120	(208,152)	UNMOVE (2580)
39168	(0,153)	REPORT FIREFLAG to C0% (2700)
39184	(16,153)	REPORT EDGEHIT, COLLISIONS TO C1%,C2%, C3% (2710)
39232	(64,153)	REPORT PLAYER MOVING TO C4% (2720)
39248	(80,153)	REPORT BOUNCING/SPRITE to C5% (2730)
39280	(112,153)	REPORT BOUNCING/FOREGROUND to C6% (2740)

Pages 154-158: available for your machine language routines

addr.	(low,pg.)	ROUTINE (loaded at BASIC line number)
40704	(0,159)	WRAPUP (2900)

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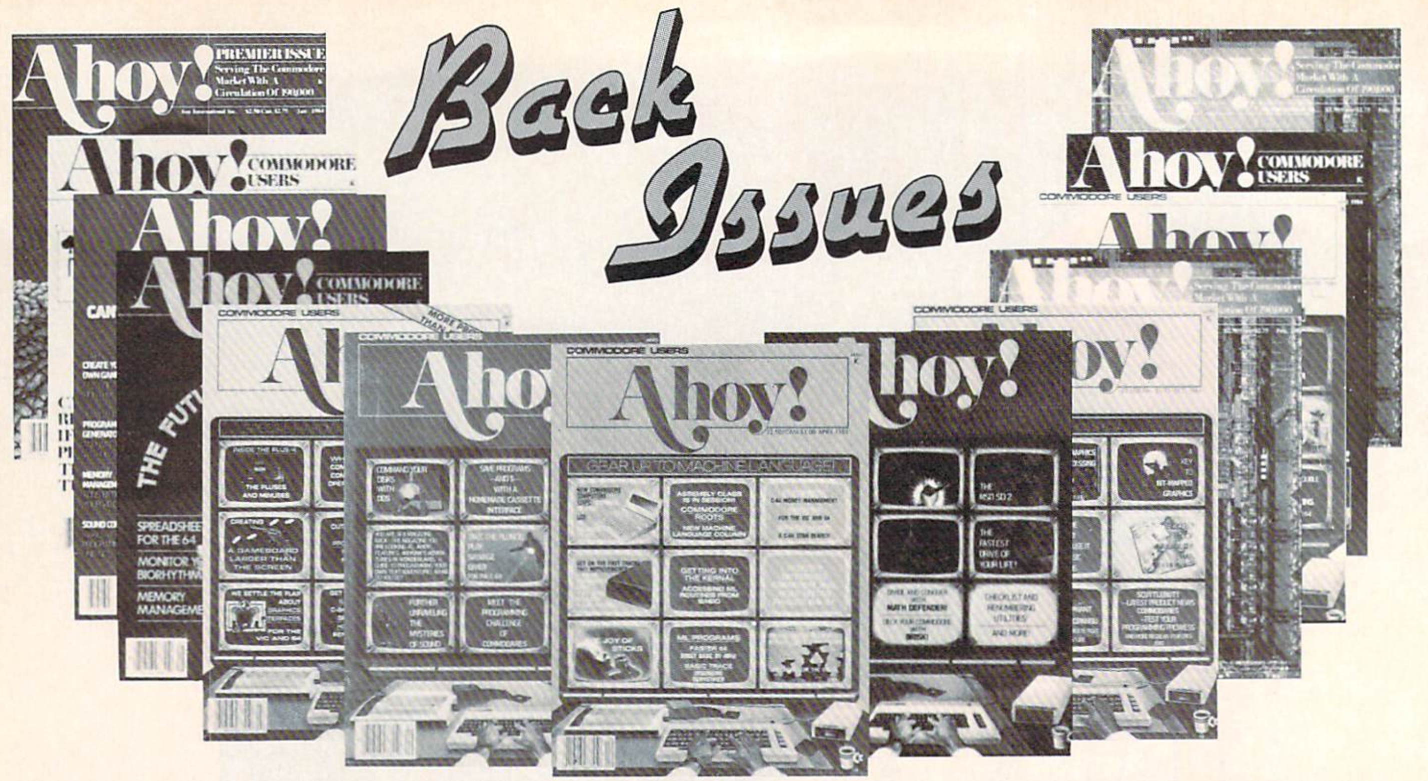
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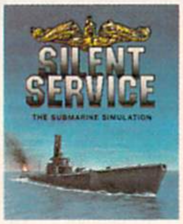
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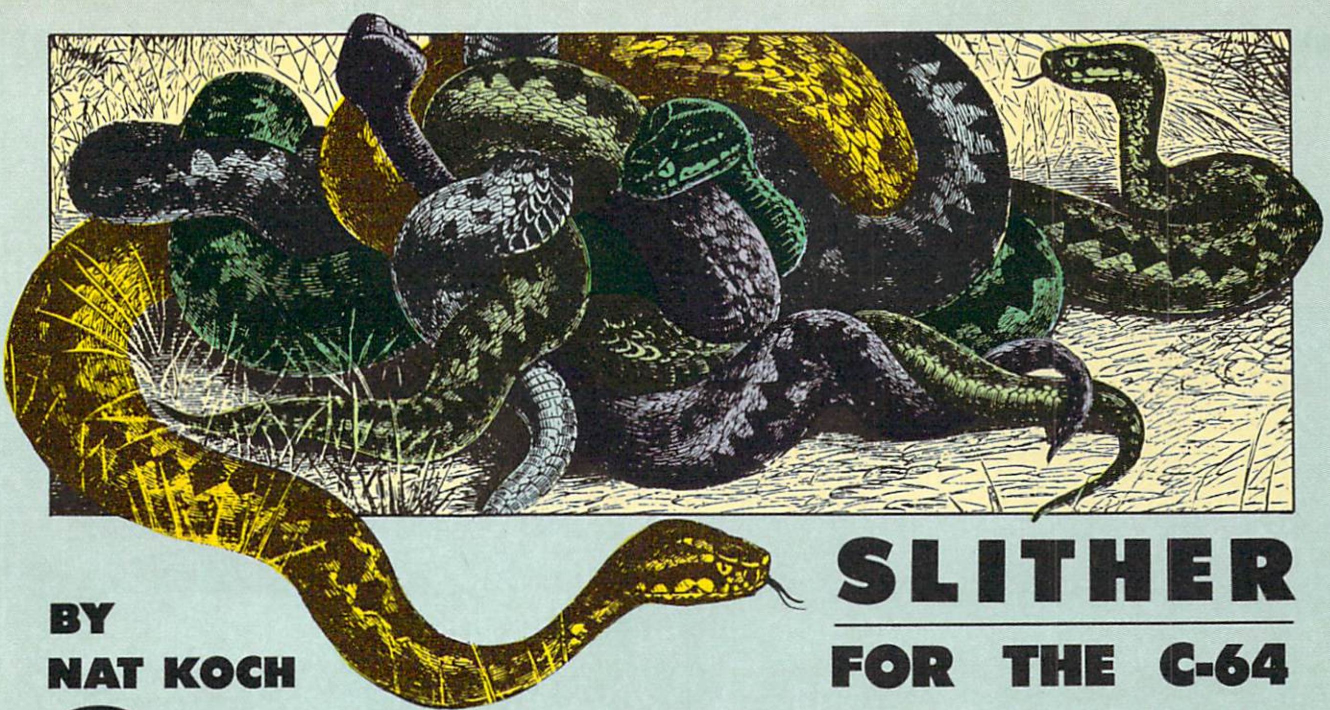
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SLITHER

FOR THE C-64

BY NAT KOCH

Got fast reflexes? Then *Slither* is for you. The object is to collect prizes from the 40 rooms of a deserted castle by maneuvering the snake and avoiding walls and the snake's tail, which grows continuously (use a joystick in port 2). Collide with either, and you lose a life (you start with seven). If you succeed in gulping down the prize, you move to the next screen; the screens get more difficult as you go along.

After you complete a screen you get a bonus which is the same as the value of the prize on the next screen. If you complete all 40, you get a bonus equal to the sum of the values of all 12 prizes (1,860).

When you run *Slither,* after a delay of about 20 seconds the title screen appears and you'll be prompted to enter the difficulty (one is best for beginners and is the most playable). This corresponds to the number of prizes you must collect on each screen, so screens on difficulty level two are worth more than those on level one, but are harder. You also get more points for completing all screens on the higher difficulty levels.

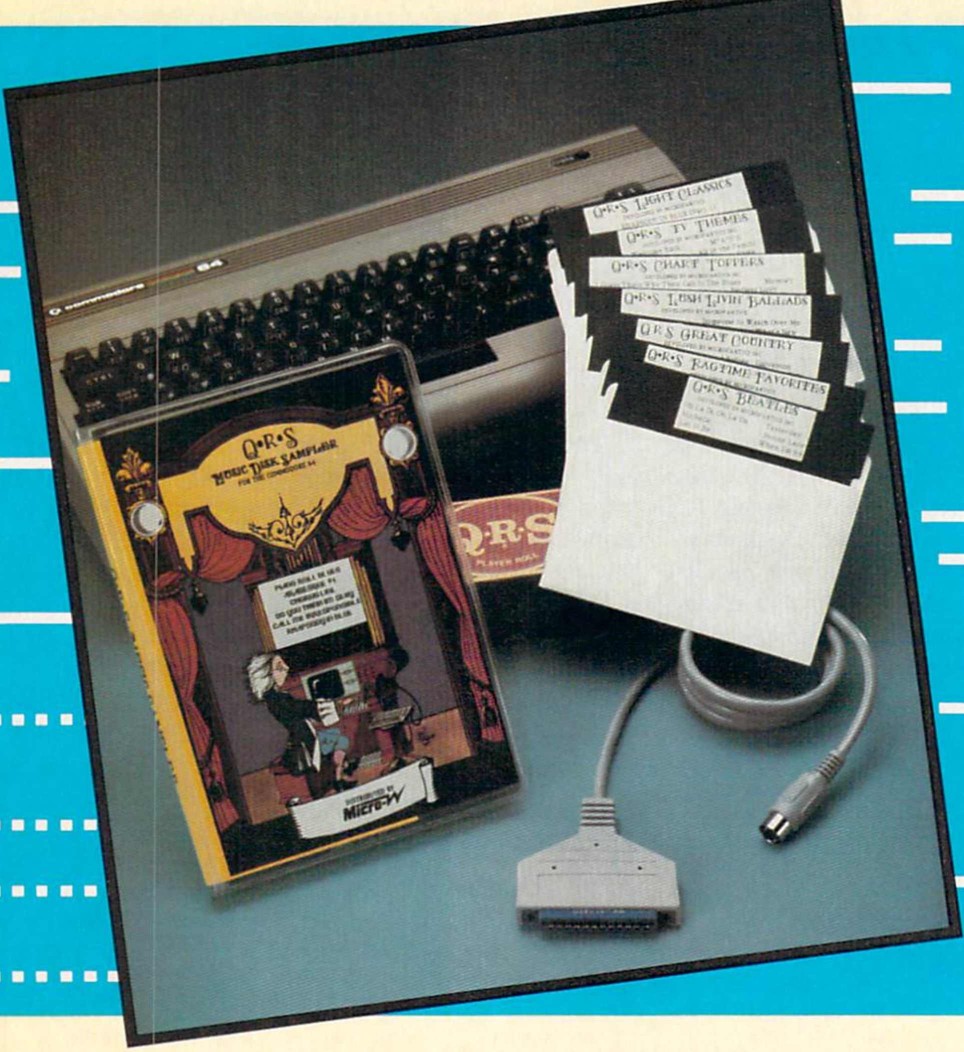
The toughest screens are #24–Deathtrap I, #27–The Web, and #38–Deathtrap II. My high score is 52,940, starting on difficulty level one. □

SEE PROGRAM LISTING ON PAGE 132

SCREEN	PRIZE	COMMENTS
1. The Courtyard	strawberry (10)	no walls
2. The Gatehouse	plum (25)	one small room
3. The Barracks	lemon (50)	
4. The Garden	pineapple (75)	
5. The Chapel	apple (100)	a bit more difficult
6. The Pit I	banana (125)	one room inside another
7. Gallery I	silver bell (150)	all vertical walls
8. The Library	gold bell (175)	difficult when prize is in aisle
9. The Snake	candy cane (200)	narrow halls, dead ends
10. The Colonnade	silver ring (250)	all vertical walls, very narrow halls
11. The Wine Cellar	gold ring (300)	all horizontal walls
12. The Three Rooms	wreath (400)	three small rooms
13. The Double-E Room	"	narrow outer halls
14. Gallery II	"	very narrow halls, three areas
15. The Oval Room	"	one oval-shaped room
16. The Greenhouse	"	three long dead-end halls
17. The Mesh Room	"	all vertical, tricky maneuvering
18. The Prison	"	two rooms with narrow doors
19. The I-J-K Room	"	diagonal walls and one small door
20. The Cubicles	"	all short vertical walls
21. Triple-T	"	three areas
22. The Vestibule	"	very narrow doors, very tricky
23. The Arena	"	one semi-enclosed area
24. Deathtrap I	"	confusing layout, VERY difficult
25. The S-Chamber	"	s-shaped central wall
26. The Spiral Hall	"	two areas connected by a twisty hall, tricky maneuvering
27. The Web	"	very tight turns, the toughest
28. The Maze	"	two areas separated by one wall
29. The Pit II	"	two rooms inside another
30. The Atrium	"	three rooms, cross-shaped middle
31. The Cloakrooms	"	four very small rooms and doors
32. The Dungeon	"	thick-walled, two main rooms
33. The Shifting Hall	"	six rooms linked by two halls with broken wall, VERY difficult
34. The Suite	"	four rooms
35. The Pantry	"	mostly vertical walls
36. Gallery III	"	two main areas, one thick wall
37. The Windbreak	"	staggered vertical walls
38. Deathtrap II	"	four rooms, very narrow doors, connected by a chamber–tough
39. The Wall	"	one long horizontal wall
40. Deathtrap III	"	confusing layout, tight turns

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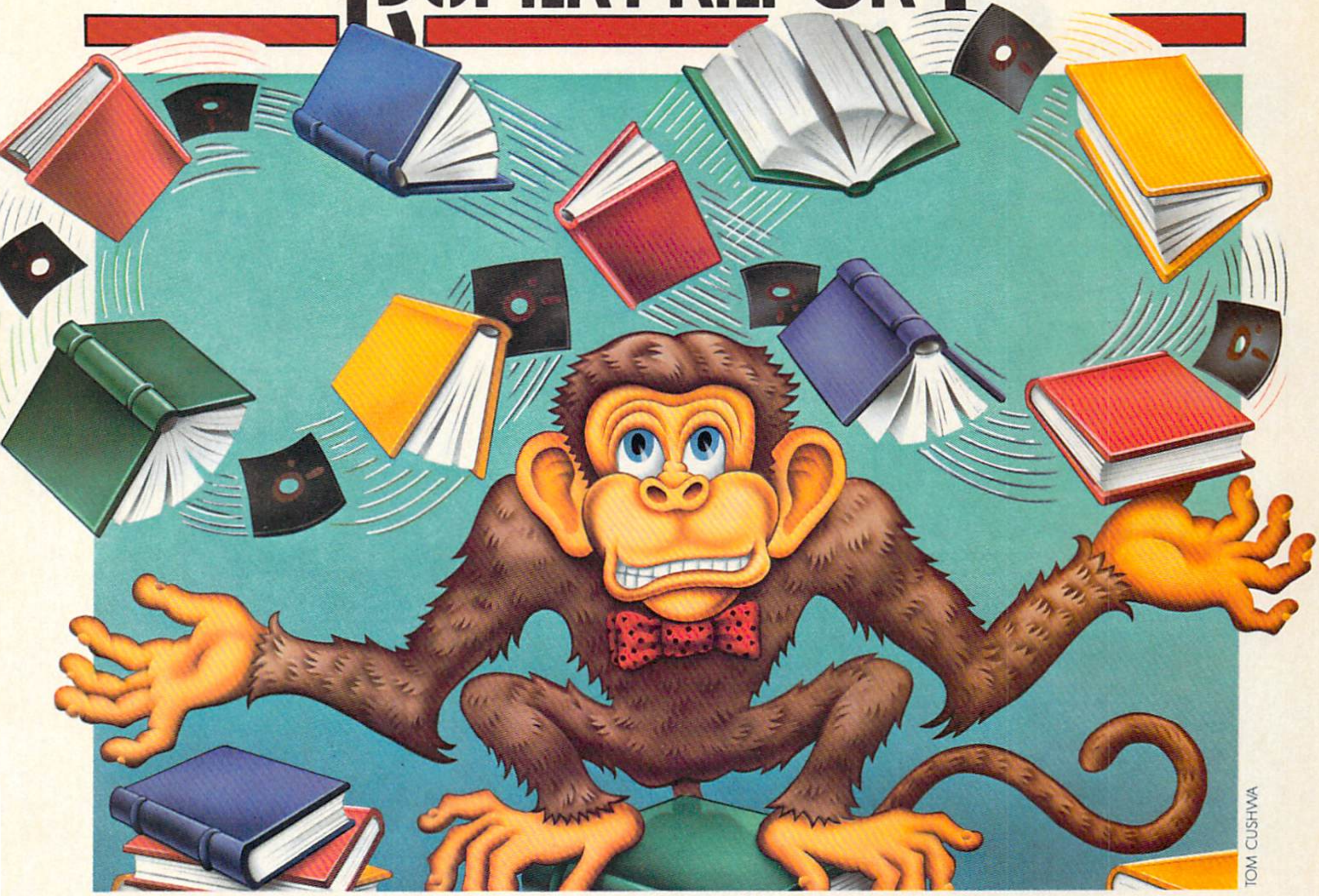
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TOM CUSHWA

Monkey Business

Multitudes of Primates at Keyboards

By Dale Rupert

What do you get if you put an infinite number of monkeys at an infinite number of keyboards and let them type for a while? An infinite amount of garbage, you say? That is certainly true. In addition to the garbage, you will also find the complete text of the Encyclopedia Britannica and every other tome you can imagine. Furthermore, somewhere you will see the complete text of the Encyclopedia Britannica but with a single word misspelled, and one version with two words misspelled, and so forth.

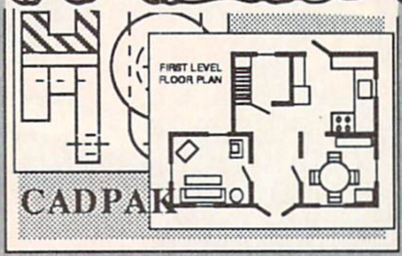
Impossible, you say? Granted it is impossible to round up an infinite number of monkeys and keyboards, but if we could, every piece of writing (including this article) would be duplicated somewhere amidst the infinite number of typed pages. The fundamental concept here is never to underestimate the power of infinity.

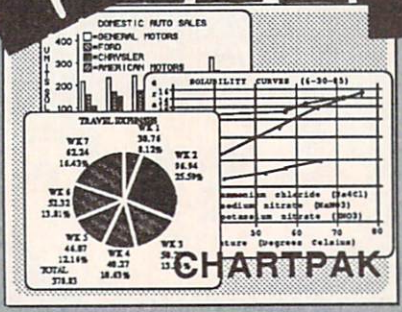
Some basic mathematics should convince you that, given some quantity of the twenty-six characters in the alphabet, there is only a finite number of combinations of those characters. For example, if each monkey were allowed to type a specific number of characters at random, the number of differing results may be calculated as follows. There are twenty-six possible choices for the first character and twenty-six possible choices for the second character. If all the papers were collected after each monkey had typed just two characters, there would be 676 different types of papers (26 times 26 equals 676).

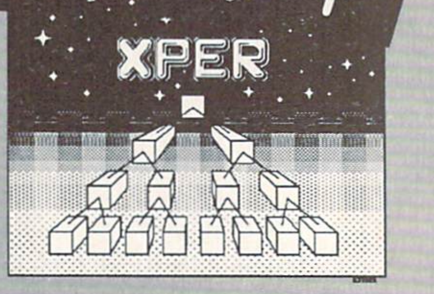
If three characters were typed on each page, there would be twenty-six variations for each one of the 676 two-character papers, giving a grand total of 17,576 pos-

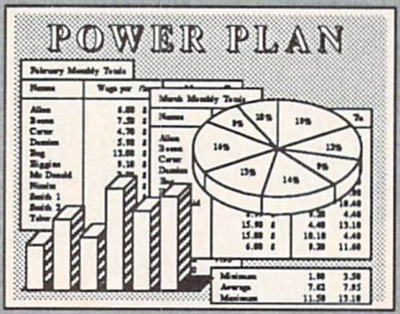
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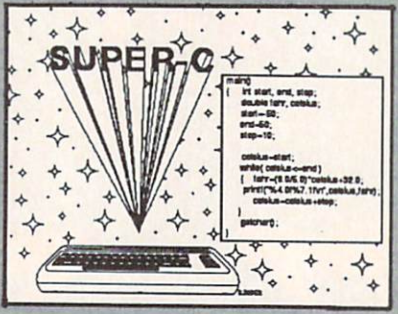


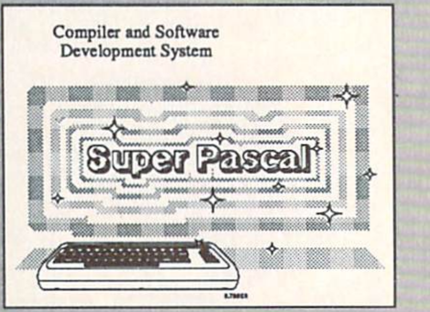












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sible results. In general, if each monkey typed X characters, the number of different results would be 26 raised to the X power. Clearly, if X is as large as the number of characters in an encyclopedia, the total number of combinations of those letters is incredibly huge.

Keep in mind, however, that this is still a *finite* number and could be calculated. With an *infinite* number of monkeys at work, there would actually be an infinite number of duplicates of each of the possible combinations! Mind-boggling, but true.

PRIMATE FUN

Throughout our discussion, we will assume that a monkey at a keyboard presses keys strictly at random. As you may have surmised, we will simulate the monkeys' keystrokes by means of the random number generator in our computer. In fact, that is very easy to do as the program *Strictly Random* (see page 124) shows.

We are assuming that the twenty-six letters of the alphabet are equally likely to be typed. The simulated keyboard actually consists of twenty-seven characters, including the space character. Normal text also contains punctuation marks and numerals, but we will not bother with them. The space character makes the random stream of characters appear somewhat like actual printed text.

Line 10 of *Strictly Random* defines the keyboard. Line 20 picks a random number from 1 to 27 (actually from 1 to 27.9999999) and prints the appropriate letter from the midst of A$. The MID$ function takes the integer part of N before picking a letter.

If you want to modify the keyboard, simply change the symbols in A$ and remember to choose a random number of the appropriate size.

You could probably let this program run from now until doomsday and not see many genuine English words. In fact, most of the display is rather uninteresting, to say the least. The problem is that the letters used in the English language do not occur uniformly. In most text, the letter "E" occurs more than one hundred times as often as the letter "Z." The space character separating words typically occurs more than twice as often as the letter "E."

If we want the random display of letters to look more like English, we must arrange things so that the monkeys are more likely to pick spaces and E's than Z's. We will use a weighting scheme which selects more common characters more often.

EVENING THE ODDS

In order to guarantee that a monkey randomly chooses an E more often than a Q, we may simply let it have a keyboard containing more E's than Q's. If you changed the string in line 10 of the previous program to contain 100 E's and only one each of the other characters, in a sense the screen would look more like real English.

We should also include more than one O and one A since they certainly occur more often than a Q or a Z. If we took a sample of text and counted the frequency of occurrence of each character, we could include proportionate numbers of characters on our keyboard.

With the proper ratios of characters on the keyboard, the monkey's printings will really look like English, or will they? Let's try it and find out.

The program *Weighted Keyboard* (see page 124) simulates a keyboard containing 1275 keys. Among the keys are 275 spaces, 130 E's, three Q's, and one Z. The relative frequencies were taken from the Cryptology section in the fifteenth edition of the *Encyclopedia Britannica.* The relative number of spaces was derived from an article on this subject in the book *Scientific and Engineering Problem-Solving with the Computer* by William Ralph Bennett, Jr. (Prentice-Hall, 1976).

It would be possible to write a program to analyze a sample of text and tabulate the relative frequencies of letters. We will save that for a future article.

As we did in the first program, we will define the keyboard by means of characters stored in a string variable. Since there are so many characters, we will use a string array. Each element of the array will store 255 characters. Consequently the array will require five elements, A$(0) through A$(4), to store the 1275 keyboard characters.

Lines 100 through 105 are DATA statements with the quantity of each character type and its symbol. Lines 190 through 260 fill the array with the proper numbers of characters. For example, the array's first element A$(0) contains 255 spaces. The next element A$(1) contains the remaining 20 spaces as well as 130 E's, 92 T's, and 13 of the 79 required N's, for a total length of 255 characters.

The computer takes a while to fill the array, but the remainder of the program runs quickly as a result of this approach. The last part of the program from lines 300 through 340 picks a random number from 0 to 1274 and selects the corresponding character from the proper element of the array.

K ranges from 0 to 1274. For example, if K is 257 (that is the 258th character), then X is 1 and CH is 3. A$(0) stores characters 1 through 255. The 258th character is the third character in A$(1). Thus the expression

```
MID$(A$(X),CH,1)
```

in line 320 selects the proper character from A$(1), and line 330 prints it. The process is repeated continuously.

The display is fascinating. Watching it is somewhat similar to watching the bells, bars, and lemons of a slot machine. You get the feeling that before long a genuine eight letter word will be generated before your very eyes. Alas, the payoff is comparable to that of a slot machine. Occasionally there are real three- and four-letter words generated, a mere pittance. It does become hypnotic after awhile. But even after more minutes of watching than I care to admit I have not seen any five-letter words surrounded by spaces that I recognize.

NO GETTYSBURG ADDRESS

Perhaps you will do better. Sooner or later the Gettysburg Address will appear before you. But if it does, don't tell anyone. No one will believe you. At least anyone who

appreciates the improbability of such a sequence of characters being generated will dismiss your claim immediately.

To get an idea of the (un)likelihood of the Gettysburg Address being generated randomly, consider the mathematics. Assume that you have just seen the characters "FOUR SCORE AND " appear on the screen. Let's find the probability that the next characters are "SEVEN YEARS AGO". Since there are 1275 characters, 61 of which are S's, the probability that the next character is an S is 61/1275. The probability of an E being next is 130/1275. After that must come a V with its probability of 15/1275, and so forth.

The overall probability of the five letters "SEVEN" appearing next in that order is simply the product of the individual probabilities. Hence

$$(61/1275)(130/1275)(15/1275)(130/1275)(79/1275)=3.6\ E-7$$

or not quite four chances out of ten million. What this means is that if you found ten million occurrences of the words "FOUR SCORE AND " throughout the randomly generated text, probably not more than four of them would be followed by the word "SEVEN".

In fact there will be more instances in which the other counting numbers "ZERO" through "NINE" appear instead of "SEVEN". (The previous statement is true with one exception. Can you find the exception?) The probability of the rest of the characters in the Gettysburg Address appearing in the proper order can be calculated similarly.

As we have stressed in previous articles dealing with random numbers and chances, probabilities help us predict average results, but specific results are unpredictable. Consequently it is certainly *possible* but very *improbable* that when you run the program *Weighted Keyboard* you will see very much intelligent prose.

FURTHER IMPROVEMENTS

The *Weighted Keyboard* generates significantly more valid words than the *Strictly Random* program does. One obvious shortcoming of the *Weighted Keyboard* is that it allows two or more spaces to occur sequentially. To remedy that situation, simply add these lines:

```
315 L0$=L$: REM SAVE PREVIOUS LETTER
325 IF L0$=" " AND L$=" " THEN 300:REM D
ON'T PRINT
```

Another addition to the program so that the output is more Englishlike is to eliminate Q's not followed by U's. Line 326 is a quick fix:

```
326 IF L$="Q" THEN L$="QU"
```

There are many other letter combinations which would never occur in normal English words, such as ZX, GQ, and so on. It would be straightforward to check for such occurrences and eliminate them before they are printed with statements similar to this one:

```
327 IF L0$="Z" AND L$="X" THEN 300
```

A more productive approach is to consider the frequencies of two-letter pairs, and to randomly choose one letter from a list of characters that is weighted by the previous letter which was chosen. For example, we could analyze English text to find out how often the letter E is followed by the letter A, and how often E is followed by B or by C and so forth. Once the letter E has been chosen, the program would use a special "E" keyboard from which to choose the next letter. The "E" keyboard contains letters in proportion to their frequency of following the letter E.

Similarly we would construct an "A" keyboard, a "B" keyboard, and so forth. The "Q" keyboard would contain only one character, the letter U, since once a Q has been typed, the next character chosen must be a U. Assume that we analyze some text and find that the letter O is followed by A three times, by B twice, by C zero times, and by D four times. The first characters in the string representing the "O" keyboard would be "AAABBDDDD...".

We can repeat this process for every letter and create twenty-seven different keyboards. Our program would choose a character at random from the *Weighted Keyboard* string. Depending upon which character is chosen, the next character would be chosen from that character's keyboard. The third character would be chosen from the second character's keyboard, etc.

Each character is randomly chosen, but the probability of choosing a particular character now depends upon the character which was picked just before it.

The framework is established for creating such a program. We must obtain letter-pair frequencies in order to create our keyboards, but they could be created just as we did in the *Weighted Keyboard* program. If you are inspired to undertake such a task, the details should not be terribly difficult.

For a much deeper analysis of this problem, as well as programs to implement it (although somewhat different in construction from the description above), I strongly recommend reading Dr. Bennett's book listed earlier. He deals with letter frequencies that vary from author to author and from language to language. In one of his talks on this subject, Dr. Bennett attached the computer to a speech synthesizer and generated sound as well as text. You might do the same.

It is possible to extend the concept of letter-pair frequencies even further. The program would choose the next letter from a keyboard with numbers of letters in proportion to the two previously chosen characters. Once A and H had been chosen, the computer uses an "AH" keyboard to select the next letter. If it happens to be an O, the next letter is chosen from an "HO" keyboard.

Once again, the computer provides a means of investigating phenomena which are impossible to control in reality. Taking care of a few hundred monkeys would be an enormous task—let alone an infinite number of them!

Now whenever someone asks what your computer can do, simply respond, "It writes Shakespeare (given enough time)." ☐ ***SEE PROGRAM LISTING ON PAGE 124***

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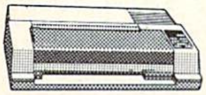
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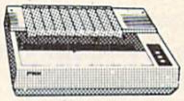
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JB-1205 Amber 139

PANASONIC
DT 1300 RG1 composite 247

X-TRON
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SD2 Drive (C-64) 469

INTERFACING

QRD
GPC (C-64) 59

CARDCO
G-Wiz (C-64) 54
C/? + G (C-64) 45
C/?PS (C-64) 49
C/?B. (C-64) 39

TYMAC
Connection (C-64) 55

AXIOM
Parallax (C-64) 65

DIGITAL DEVICES
U-Print C (C-64) 49

ORANGE MICRO
Grappler CD (C-64) 79

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TIPS AHOY!

CIA INFILTRATORS

The CIA1 chip in my Commodore 64 went bad recently. I suspected this chip to be defective because part of my keyboard was dead. Unfortunately of the eight keys dead, the RETURN key was one. I have a program that does a diagnostic check but without the RETURN key I couldn't load and run it.

On the Kaypro a control-m (CTRL-M) is the same as a return. I tried it on my 64 and it worked!

—Gary Smith
Ponca City, OK

SAVED AGAIN

Resaver is a short utility for the VIC and the C-64 that eliminates the risks associated with the infamous Save and Replace function of Commodore's DOS.

Resaver works by diverting the Save vector ($332-$333) to point to itself. When the operating system encounters the token for Save, it performs the preliminary steps, then jumps through the Save vector to Resaver where the command channel to the disk is opened, followed by the codes for scratch (S0:) and the file name. Once that is accomplished, the command channel is closed and control is passed to the Kernal Save routine.

```
10 REM **      RESAVER       **
20 REM ** BY SHAWN K SMITH **
30 :
40 REM SYS(830) ACTIVATES, RUN STOP/REST
ORE DE-ACTIVATES
50 REM LINE 110: 165,189, TO 169,008: DV
#=8: T=7495
60 :
80 FOR D=830TO885:READY:POKED,Y:T=T+Y:NE
XT
90 IFT<>7669THENPRINT"RECHECK DATA!":STO
P
100 DATA 169,073,162,003,141,050,003,142
110 DATA 051,003,096,165,186,133,186,032
120 DATA 177,255,169,111,133,185,032,147
130 DATA 255,169,083,032,168,255,169,048
140 DATA 032,168,255,169,058,032,168,255
150 DATA 160,000,177,187,032,168,255,200
160 DATA 196,183,208,246,032,174,255,076
170 POKE886,PEEK(818):POKE887,PEEK(819)
200 SYS830:POKE199,9:PRINT"RESAVER'S ACT
IVE"
```

The utility can be deactivated by hitting the RUN/STOP-RESTORE combination. SYS 830 will reactivate it. Addi-

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tionally, with minor changes to line 110, you can eliminate the ",8". It will be assumed! —Shawn K. Smith
Bronx, NY

FILE CAMOUFLAGE

Have you ever had a kid sister or brother, or for that matter anyone, snooping around your diskettes? Here is a simple way to stop them from meddling with your files. When you normally save a program you type SAVE"progname",8 and the directory will list the file as a program (PRG) file. BUT if you type SAVE"progname,s",8 the program will be listed in the directory as a sequential (SEQ) file. The only way to regain access to the file is to load it as follows: LOAD"progname,s",8. This way only people who know your program is not really a sequential file will be able to gain access to it. You can also use this idea with "progname,u" replacing "prognam,s". The disk directory will list the program as a user (USR) file.
—Wesley Vriend
Houston, B.C.

IN-CODE LOAD

The LOAD instruction in the Commodore 64 has a strange anomaly. When used inside a program, program flow does not return to the next statement, but back to the beginning of the program! LOADs inside a program are most often used to load in some accessory ML program. For example, consider the following bit of code:

```
10 LOAD "ML01",8,1
20 PRINT "READY?":REM CONTINUE...
```

If you run this code, line 20 will never be executed. Most people avoid this with:

```
10 IF A=0 THEN A=1:LOAD "ML01",8,1
20 PRINT "READY?":REM CONTINUE...
```

The following bit of code shows a better way, plus it allows for complete freedom in relocating the load.

```
10 OPEN 1,8,0,"ML01,P,R"
20 POKE 185,X:REM X=1 USE LOAD ADDRESS S
TORED WITH FILE, X=0 RELOCATE LOAD
30 POKE 780,0
40 POKE 781,LA:POKE 782,HA:REM LA, HA LO
W AND HIGH BYTE OF NEW LOAD ADDRESS
50 SYS 65493:CLOSE 1
```

It seems like more work, but it is much easier to debug than the other way, especially if the loads are scattered throughout the program.

Here is a small program which allows memory dumps to disk from inside a BASIC program:

```
10 OPEN 1,8,1,"ML01,P,W"
20 POKE 193,SL:POKE 194,SH:REM SL,SH LOW
 AND HIGH BYTE OF START ADDRESS
30 POKE 174,EL:POKE 175,EH:REM EL,EH LOW
 AND HIGH BYTE OF END ADDRESS
40 SYS 62957:CLOSE 1
```

—Don Lewis
Folsom, PA

See the bottom of the following page for information on submitting your programming hints to Tips Ahoy!

STRUCTURED BASIC?

Teaching students to write structured BASIC programs would be much easier if the computer would allow multiple spaces for indentations after a line number.

This IS possible on the Commodore 64. The line number can be followed by [COMMODORE J]. The remainder of the line can have any number of spaces left before the first keyword for indentation. The graphic symbol which appears the first time does not show up when you go to list the program. But the extra spaces disappear if the line is edited after LISTing (unless COMMODORE J is inserted again). Somehow, this simple procedure does not sink in on many students. However, an even simpler technique does: following a line number with a colon (:) has exactly the same effect as the COMMODORE J. The colon does show up when the program is LISTed, but editing the line does not eliminate the extra spaces. —Jack Ryan
El Dorado, AR

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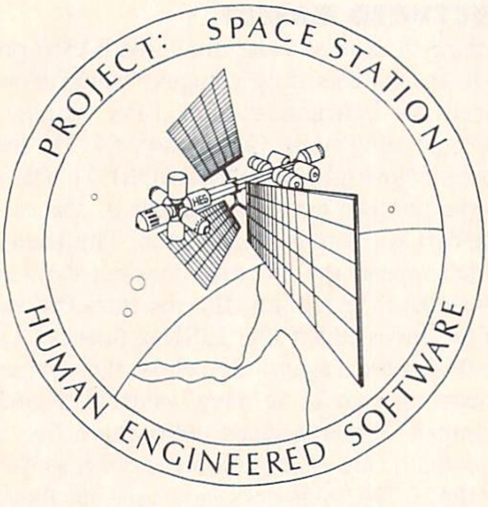
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INPUT RELIEF

Many of us often become sick from having to view Commodore's seemingly mandatory question mark when using the INPUT statement. It's plain annoying sometimes! Any program without it is thought to possess a slight bit of added style. We all wish it were easier to eliminate that dreadful scoundrel.

Well, it is rather simple. The secret is a little-known fact that the keyboard has a device number of 0, and that any piece of hardware with a device number can have an input channel opened to it. One can accomplish the same effect as using the INPUT statement by trying the short and simple routine shown below.

```
10 OPEN 1,0
20 PRINT"TYPE SOMETHING: ";
30 INPUT#1,T$
40 PRINT
50 CLOSE 1
60 PRINT"YOU TYPED: ";T$
```

Line 10 opens the input channel to the keyboard. Line 30 gets the user's input. The PRINT in line 40 is necessary to move the cursor to the next line. And line 50 closes the channel. No question mark appears with this method, and it makes INPUT slightly more appealing.

—Kevin Brown
Anderson, IN

WRITE PROTECT TAB CHECKER

Have you ever wanted to put a simple routine in one of your programs to check to see if your diskette has write-protect on it? Here is a short routine that does so.

```
10 OPEN 15,8,15
20 PRINT#15,"M-R"CHR$(0)CHR$(28)
30 GET#15,A$:A=ASC(A$+CHR$(0)) AND 16
40 IF A=0 THEN PRINT"WRITE-PROTECT IS ON
"
45 IF A<>0 THEN PRINT"WRITE-PROTECT IS O
FF"
50 CLOSE15
```

The program reads bit 4 of a port at $1C00 on the disk controller. If the bit is set, the notch (write protect) is open.

How would you like to control the speed of your cursor in a program? To control cursor movement you can POKE56341,1 to speed it up and POKE56341,255 to slow it down.

—Mark Baker
East Wenatchee, WA

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Music Shop	?	105 sec.	105 sec.*	105*	**21 sec.**
Hitchhiker's Guide to the Galaxy	?	70 sec.	70 sec.*	N.G.**	**68 sec.**
On-field Football	?	159 sec.	66 sec.	63 sec.	**56 sec.**
EASY FINANCE I	?	58 sec.	13 sec.	13 sec.	**11 sec.**

*Will not fast load-defaulted back to regular load.
**Failed to load at all.

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DISKETTE MATCHER (compare sectors)
UNSCRATCH A FILE (recover file)
VIEW BAM (block allocation map)
1541 READ/WRITE TEST
½ TRACK READER
HEADER READER (display disk header)
SYNC MAKER
DEVICE NUMBER CHANGE (disk drive)
ELECTRONIC ARTS BACKUP
DRIVE MON (disk drive m/1 monitor)
DISKETTE FILE LOG (start-end address)
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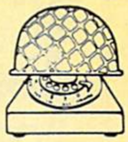
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UN-WRITE PROTECT (diskette)
UNNEW PROGRAM
WEDGE-$8000
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KOALA DUMP (koala pad screen dump)
DISK MANIPULATION SYSTEM
DISK ERASER (20 second clean wipe)
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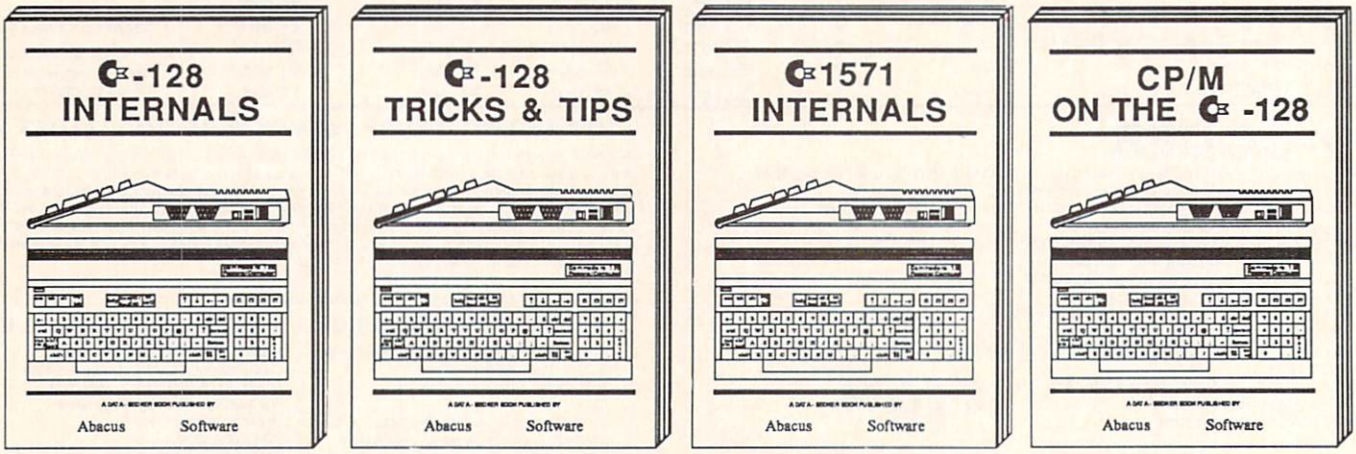
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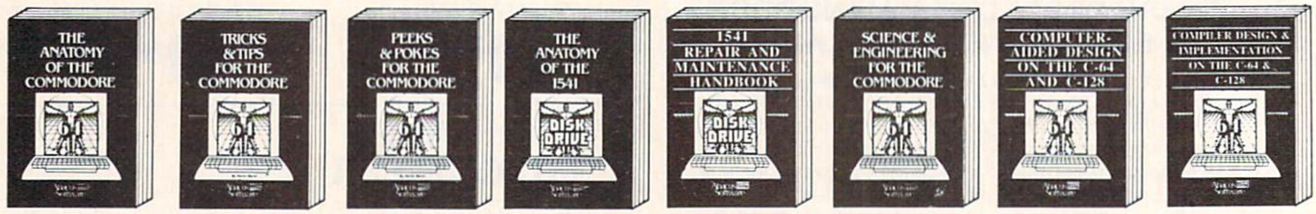
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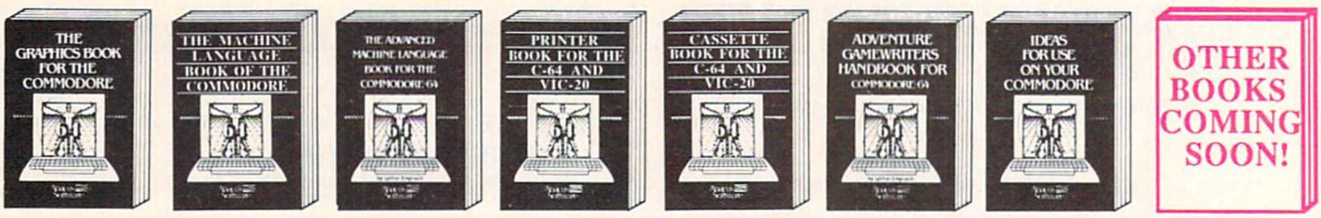
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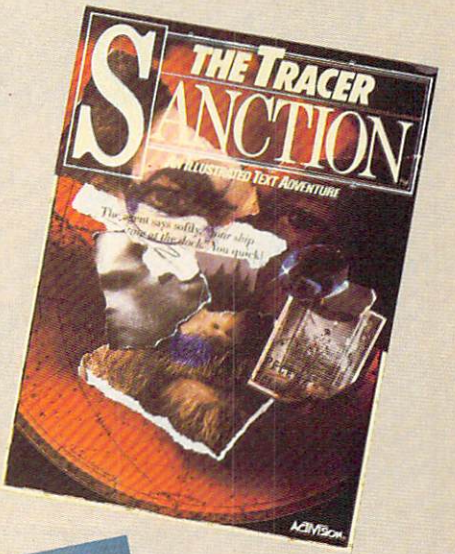
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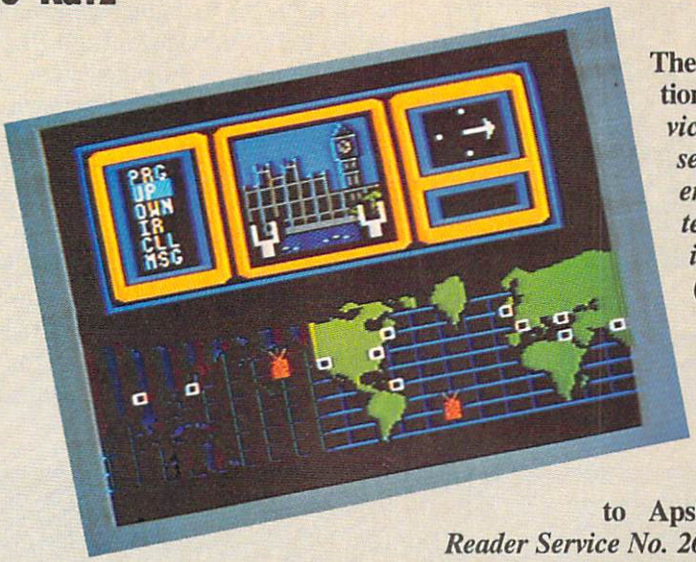
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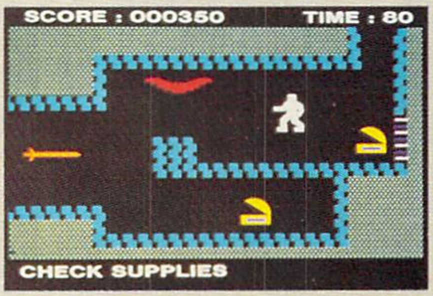
Role-Playing Software for the Commodore 64

By Arnie Katz





The Tracer Sanction *(Reader Service No. 266) sends adventurers after an interstellar criminal.* Hacker *(left; Reader Service No. 267) embroils the player in a vast conspiracy.* Gateway to Apshai *(bottom; Reader Service No. 268) includes a monster-filled multilevel dungeon.*



The adventure is now the most popular form of entertainment software, supplanting shoot-em-ups. Computerists are discovering that blasting invaders can't compare with the rich, vicarious experiences available in role-playing programs.

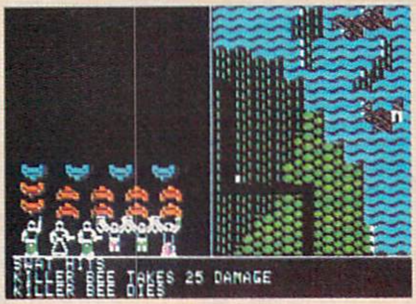
As recently as 18 months ago, Commodore 64 owners must have wondered if the adventure game boom was going to overlook them. The system's software library included very few adventure titles, and publishers didn't seem in a hurry to rectify the situation. This paucity of adventure games resulted from a widely held belief that the Commodore 64 isn't suitable for such software.

What led people to this erroneous conclusion? Blame the Commodore's slow disk access. Adventures generally contain more code than most micros can hold at one time. Therefore, many titles periodically pull data from the disk to augment the information contained in the initial load.

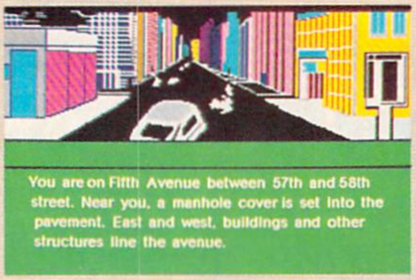
According to the conventional wisdom of mid-1983, Commodore owners would not accept a long wait whenever the program returned to the disk. Since action contests reigned supreme at the time, publishers feared tackling a small, lukewarm market. They found it easier to ignore the problem than to solve it.

Several factors have turned scarcity into abundance. When adventures for microcomputers grew more popular, it heated up the demand among Commodore 64 owners, too. Software makers, reeling from the slump in action game sales, re-evaluated their earlier policies. Many decided that offering adventures for the Commodore 64 wasn't such a longshot gamble, after all. If Commodore owners wanted adventures badly enough, they would endure slow disk access.

The risk paid off handsomely. A few hits opened the floodgates. Now Commodore users can choose from among more than 60 titles with themes ranging from time travel to crook-catching.







Top to bottom: **Phantasie** *(Reader Service No. 269),* **Amazon** *(Reader Service No. 270), and* **Fahrenheit 451** *(Reader Service No. 271)*

Realms of Fantasy

Slaying dragons and rescuing fair maidens are still the most popular tasks for adventurers. Other themes are gaining, but fantasy is still king.

Zork I-II-III (Infocom) are classics which have stood the test of time. Although Infocom completed this fantasy trilogy in 1983, it holds its own against many newer programs. Although each third of the epic has a definite goal, the designers constructed the vast underground empire to encourage freelance exploration and adventuring.

Infocom has also published the first two parts of a new trilogy, *Enchanter* and *Sorcerer.* Similar to the *Zork* series in feel, it differs in one major respect: the hero is a magician instead of a warrior. Spellcasting makes a refreshing change from slinging a sword.

Ultima III (Origin Software) is the closest approach to a graphics adventure for the Commodore. Lord British's third game (following *Ultima I* and *Ultima II*) is his most majestic. The player can explore a fantasy wilderness and descend into dungeons, presented in first-person perspective, for some serious adventuring.

Questron (Strategic Simulations) is an especially good choice for those who've already tried the *Ultima* trilogy. The player must subdue a continent of monsters to reclaim the heart of a demon before its power engulfs the whole world. Charles Dougherty's design is less grandiose than *Ultima,* but it plays more smoothly thanks to a joystick-driven menu command system.

Doug Wood's *Phantasie* (Strategic Simulations) also owes something to *Ultima* in the areas of graphics and overall presentation. One to six characters cooperate to find the nine mystic rings which can vanquish the Black Lord. A party of mixed characters, each with a set of unique abilities, gives the gamer a lot to do.

Fantasy is a favorite subject for action adventure. *Gateway to Apshai* (Epyx) has a multilevel dungeon stocked with a wide assortment of monsters and treasures. Its sophisticated command control system, which works with keyboard or joystick, gives it features not normally found in action adventures, such as characters who gain levels of ability as they amass experience.

Return of Heracles (Quality Software) is not a real-time simulation, but it resembles other action adventures in most respects. Stuart Smith weaves classic Greek myths and legends into an open-ended mosaic. One or more players use a joystick-driven menu system to control as many heroes and heroines as it takes to per-

WHAT IS AN ADVENTURE?

Ever meet an alien or stalk a murderer? Adventures let us explore worlds filled with terrifying dangers and priceless treasures without leaving the computer.

The program author creates the background and characters and then thrusts the player right into the middle of the action. In a sense, adventures are like novels in which the reader and writer work together to construct the plotline.

Interaction is the key. The player enters commands, and the program reports the consequences. The nature of those commands and responses varies from title to title, but most adventures fit into one of four broad categories.

The most common format is the text adventure. Like radio, the all-prose game requires the player's imagination to fill in the visuals. Text partisans claim that even the newest microcomputers can't present illustrations as vibrant and detailed as the ones which the mind conjures.

Illustrated adventures follow the dictum that a picture is worth a thousand words. They employ a mixture of prose and artwork to inform players about what's happening in response to typed commands.

Manual dexterity plays a larger role in action adventures than it does in the other three types. The joystick moves the character around what amounts to a schematic map of the game's setting. The player can also perform simple actions like shooting and taking objects. Everything takes place in real time. This instant feedback gives action adventures a high excitement level and rapid pace which text and illustrated adventures can't match.

Graphics adventures blend aspects of the three other types to create a more encompassing and satisfying play-experience. They often use first-person or pseudo-3-D perspective to heighten the identification between the gamer and his or her onscreen surrogate. Animation, sound, and detailed

form the 12 labors of Heracles.

Ali Baba (Quality Software), another Stuart Smith triumph, shows the author's penchant for offbeat subjects. "1001 Arabian Nights" is the theme for this one- or two-player real-time quest to rescue a kidnapped princess. Computerists can easily adjust the difficulty level of *Ali Baba* by varying the number of characters used to get the girl back. Anyone who can perform the deed with only the vulnerable and lightly armed Ali Baba deserves an "expert" rating.

Randall Don Masteller is the creator of *Dunzhin, Kaiv, Wylde,* and *Zigurat* (Screenplay), a quartet of action adventures. Each disk thrusts the hero into a different fantasy environment, from a subterranean maze to the spires of a fortress city. The graphics aren't as crisp as in *Gateway to Apshai,* but Masteller's tetralogy gives gamers at least as much scope for activity.

Visiting the Future

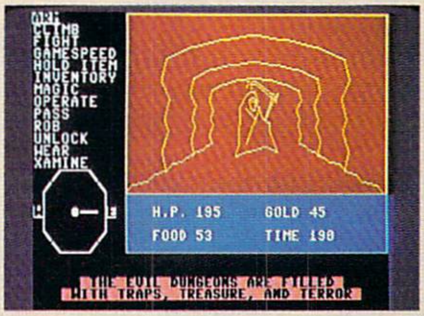
For some unfathomable reason, software publishers greatly prefer fantasy to science fiction as a theme for games. Yet there are a few notable titles.

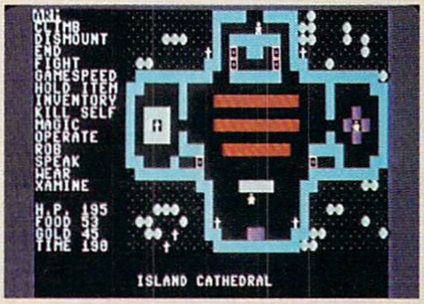
Mindwheel (Synapse-Broderbund) incorporates aspects of both science fiction and fantasy. The protagonist is a volunteer who must travel telepathically through four linked minds before going all the way back to the dawn of society to fetch the Wheel of Wisdom. Only the lore contained in this mystic artifact can prevent the world from degenerating into bloody anarchy. Robert Pinsky, author of *Mindwheel* and a successful poet, writes lyrical prose full of striking images, but some computer adventurers may find it a bit flowery for their taste.

Fahrenheit 451 (Telarium) begins where the Ray Bradbury novel ends. As Montag, the player is a fugitive in a hostile city who must follow a twisty path to strike a blow against the tyranny of the book-burners. Excellent spot illustrations, printed along the top of the display, effectively complement the prose.

Suspended (Infocom) has one of the cleverest premises in the annals of gaming. The hero's brain is the human component of a vast computer system which runs a future society. An alarm device awakens this brain, because a worldwide catastrophe has occurred. The computerist uses a squad of sensor robots to discover and fix the problem before things fall apart.

Cyborg (Broderbund) is a new edition of a text adventure designed by Michael Berlyn in 1981. The man- machine protagonist returns to conscious-







Three scenes from Questron ***(Reader Service No. 272), featuring joystick-driven menu command system. See full review last issue.***

graphics add depth and richness to the game's world.

Order-entry systems proliferated in 1985, but three methods predominate in text, illustrated, and graphic adventures. Depending on the program, computerists use a parser, menus, or icons to convey their wishes to the computer.

A parser analyzes typed commands, isolates the main word or phrase, and selects the proper response from its memory. Onscreen menus list possible activities. Usually, the player highlights a choice with a joystick and presses the action button to implement it. An icon is a pictographic symbol of an action. The adventurer positions a cursor over the appropriate icon and clicks it to send the message to the machine. □

A LITTLE HISTORY

Non-electronic role-playing games (RPGs) inspired computer adventures. E. Gary Gygax and Dave Arneson got the ball rolling in the mid-1970's when they elaborated a fantasy miniatures campaign into "Dungeons and Dragons."

RPGs emphasize play-acting characters though a series of exploits. Questing parties explore the landscape and cooperate to achieve common goals.

The Dungeon Master (DM) is the driving force of a non-electronic RPG. This indispensible person designs the adventure and conducts the actual game. The party declares its intentions, and the DM responds with the results.

The catch is that the DM spends weeks or even months constructing the campaign. An episode that plays in three hours could take 10 times as long to write. And after all that work, the Dungeon Master never gets to play.

Electronic adventures replace the DM with the computer. No program can match the range and sophistication of a good DM, but computer adventures set up quickly and need no umpire. And unlike non-electronic RPGs, most computer adventures can be played solitaire.

ness without even the memory of his own identity. Only by pooling the talents of both aspects of the hero can the gamer dispel the clouds of ignorance in time to avert total destruction.

Journey into Mystery

Deadline, Witness, and *Suspect* (Infocom) are three of the best detective stories on disk. *Deadline* challenges the investigator to bring the murderer of a rich man to justice within a 12-hour time limit. *Witness* puts the player right at the scene of the crime as a shot fells the patriarch of a family. *Suspect,* the most recently published of the three, turns the tables and makes the detective the chief suspect in the case.

These Infocom text adventures feature intricate plots and characters who act independently of the detective. A sleuth might find a particular room empty at 10 a.m., overhear someone talking on the phone at 10:30, and observe a different person reading a newspaper at 11 a.m.

Stopping crime in the far future is the goal in *The Tracer Sanction* (Activision) and *Robots of Dawn* (Epyx). *Tracer* sends the computerist on an interstellar hunt for a master criminal known only as the Wing. Multiple endings allow the gamer to wrap things up in a variety of ways, depending on personal preference.

Robots of Dawn is based on Isaac Asimov's 1984 best-selling novel of the same name. The gamer becomes a detective from a somewhat dilapidated earth who travels to an advanced planet to bring the killer of a famous scientist to justice. Reading the book won't spoil the game, either, because *Robots of Dawn* diverges from the novel in many important ways.

Ripper! (Avalon Hill) summons the computerist to a high-level conference to discuss ways to catch Jack the Ripper. Unfortunately, the fiend waylays one of the famous guests and prowls the mansion killing everyone he meets. The ominous tolling of a bell tells the user that the madman has struck again in this text thriller.

Another Victorian mystery is *Sherlock Holmes: Another Bow* (Bantam). The World's First Consulting Detective, faithful Watson in tow, is a passenger aboard a trans-Atlantic steamer filled with celebrities of the day. Holmes must solve a series of minor cases, and the larger one which underlies them, before the boat docks. The display contains a generous amount of text with atmospheric illustration across the upper quarter of the screen.

The Fourth Protocol (Bamtam) is more a spy story than a mystery, but it has plenty of opportunities for sleuthing. This icon-driven adventure, inspired by the characters and situations of Frederick Forsyth's best- seller, consists of three connected episodes. *The Fourth Protocol* puts the gamer into the role of agent John Preston, who must singlehandedly foil a world-threatening Soviet scheme.

Of Worlds Unknown

Movies like *Raiders of the Lost Ark* and *Romancing the Stone* have rekindled interest in tales of lost civilizations and uncharted lands.

Mac Steele, hero of *Mask of the Sun* and *The Serpent Star* (Broderbund), is the Indiana Jones of computer adventuring. His published exploits involve the search for a Mayan artifact, and an even more exciting tale in which he must reclaim Tibetan scrolls which lead to a timeless city and its magical jewel. Animated sequences enliven both of these adventures, but the actual artwork is too ordinary to create the proper mood.

Michael Crichton wrote *Amazon* (Telarium), and his deft touch saves what could have been a ho-hum title. The plotline is still too linear, but perfect pacing and varied locations make *Amazon* very enjoyable. When a satellite transmission shows a wrecked survey camp, the investigator-hero must venture into the jungles

Scott Adams converted a dungeon called *Adventure,* which ran on mainframes, for micros. Early text titles suffered from the memory squeeze. Most consisted of a series of puzzles which the hero solves in lockstep order.

Ken and Roberta Williams started Sierra to market their invention, the illustrated adventure. Memory kept the parser-driven text to a minimum, but seeing the people, places, and things on the screen proved a popular novelty.

Next came action and graphics adventures. Andrew Greenberg and Robert Woodhead's *Wizardry* sends six characters into a multilevel labyrinth to retrieve a stolen treasure. Each character class has unique abilities: mages cast spells, priests work miracles, thieves open locks, and fighters lead the way in combat. Other important contributors to the development of these two types were Lord British *(Ultima I-III)*, Stuart Smith *(Fracas, Ali Baba)* and John Bell *(Fantasyland)*.

Increased memory has fueled recent advances. Infocom upgraded the parser and has produced a library of intricately plotted games noted for extensive descriptive prosetext. Interplay Productions (designer of *The Tracer Sanction* and *Mindshadow*) premiered a new format for illustrated adventures which combines copious use of animated illustration with substantial text blocks. Telarium and Bantam have demonstrated other ways to mix text and graphics in new proportions in their adventures.

Most recently, Synapse has introduced a line of "electronic novels." They feature a parser which facilitates a greater amount of interaction between the player and the game's characters. □

ADVICE FOR NOVICE ADVENTURERS

This magazine does not dispense solutions for specific adventure games. Timely hints can get things moving, but they also spoil the fun if unexpectedly encountered before they're wanted or needed. If you get stuck on a particular game, investigate the hint booklets which many

of the Amazon to find out what ripped apart the base and killed the whole party. Illustrations which include some animation work well with the extensive text.

When the curtain rises on *Infidel* (Infocom) the hero is in dire straits. While on an archeological dig in the Egyptian desert, he awakens alone in the wasteland near his destroyed camp. Getting out of this pickle with a whole skin, much less the treasure of the lost tomb, requires persistence and strong logical thinking.

The writing in this text adventure, more sober than in other Infocom titles, keeps the gamer immersed in the struggle. *Infidel* doesn't provide the freedom of movement found in *Zork,* but the twists and turns of the storyline, capped by a perfect surprise ending, more than make up for this.

Coming Attractions

That's the best of the current adventure crop, but what about next year's harvest? Though the future is never certain, the signs are overwhelmingly positive.

Things look especially promising for fans of mystery and spy adventures. *Hacker* (Activision) is the first adventure which actually stars a computer user. The hero logs onto a network and stumbles upon evidence of a vast conspiracy. The gamer uses a robot scout to gather enough evidence to sink the plot before it succeeds.

Activision is also readying an illustrated adventure with extensive text which should appeal to fans of hard-boiled detective writers like Raymond Chandler and Ross MacDonald. Knockabout gumshoe Sam Harlow plunges into a world of conspiracy, kidnapping, and death to protect the meek and catch the guilty.

Perry Mason: The Case of the Mandarin Murders (Telarium) brings Erle Stanley Gardner's lawyer to the gaming screen. The murder is diabolically complicated, and the plot is expected to incorporate more than two dozen possible endings.

The Alpine Encounter (Random House) is a super-spy caper set in the Swiss Alps. One highlight is an arcade-like ski chase.

Spectacular graphics are a highlight of *Alternate Reality* (DataSoft). This fantasy role-playing dares the hero or heroine to escape from an alien city.

Roger Zelazny's series of five science fantasy novels is the source for *Nine Princes in Amber* (Telarium). This tale of multiple realities and palace intrigue features a new parser which is said to facilitate a high level of interaction between the protagonist and the non-player characters.

These are only some of the forthcoming titles, but they suggest that the adventure game boom will continue for some time. There are exciting times ahead for Commodore adventurers. ☐

software manufacturers produce as a customer service.

On the other hand, there are a few things any player can do to make adventuring much more successful. The most important are:

Read the documentation. Even if you're a boot-and-bash person from 'way back, don't ignore adventure game rulebooks. It's frequently a fund of helpful information which never directly appears on the screen.

Make a map. Getting lost is all too easy in many adventures. Just draw a box for each location. Connect locations with lines labeled to show how one gets from one spot to the other. Put data about each location, like the existence of treasure, inside its box.

Read the screen carefully. Descriptions are worded to convey clues and information. Memory severely limits superfluous copy, so what's there is important.

Try things. It's only a game. The worst that can happen is that you'll have to restart. Sometimes, the results are positively shocking.

Save the game. Few players have the stamina to complete an adventure in one sitting. Saving frequently is also a good idea, because it eliminates the boring, needless repetition of starting from scratch whenever you make an error.

These guidelines don't guarantee a win, but they improve the odds. ☐



Deliver us some evil*—Mail Order Monsters *builds on 12 basic shapes.
READER SERVICE NO. 273

MAIL ORDER MONSTERS
Electronic Arts
Commodore 64
Disk; $35

This lighthearted program crosses "Rocky" with "Godzilla." The player becomes an owner/manager who designs and directs morphs (Mail ORder Psychon Heroes) in combats which take place on a variety of terrain.

Electronic authors Paul Reinche III, Evan Robinson, and Nicky Robinson provide a truncated version for beginners, and a little practice on that level won't hurt. Move up quickly, because a lot of the fun comes from actually designing the morph in the intermediate and tournament games.

The main difference between the latter two modes is that the tournament version links individual battles into a campaign. The result of each battle is saved to disk. Victory earns psychon points, which the manager spends like money to improve a fighter's abilities and equipment.

After the computerist enters the name of the manager, the program presents a selection screen. Use the joystick to walk the humanoid figure at the center to the morph vats on the far right.

This brings up an illustrated menu which depicts the 12 basic morphs. It's quite a menagerie, too. Possibilities include a crab, pterodactyl, worm, wasp, motile plant, hominid, and brontosaurus. Moving the shaft of the

joystick highlights a potential selection and summarizes its natural abilities and cost in psychons.

Pushing the action button selects the highlighted morph and calls up the screen which summarizes its basic traits. You can improve the morph's armor, muscle, speed, mind, and life, but each increment has a price in psychons.

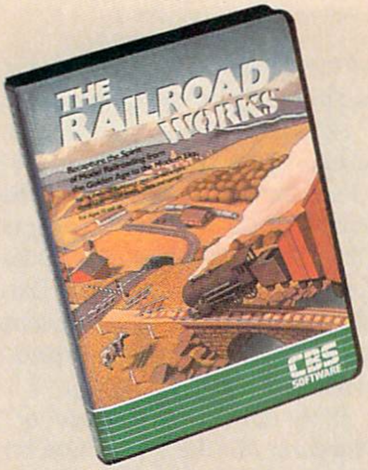
Next, shop for extra traits. These range from methods which increase movement speed, such as gills (for water) or teleportation to defenses like regeneration of life points or resistance to psi-attacks. Especially in the tournament game, which limits design costs for a morph, the manager won't be able to afford many of these extras. They can be added after a few victories.

The original selection screen reappears, but this time the manager is leading the Morph. A trip to the weapons shop comes next. There, the manager can purchase weapons, sundries, and supplies. The latter includes things like food to power physical attacks, energy packs for certain weapons, and ammo for guns and other projectile weapons.

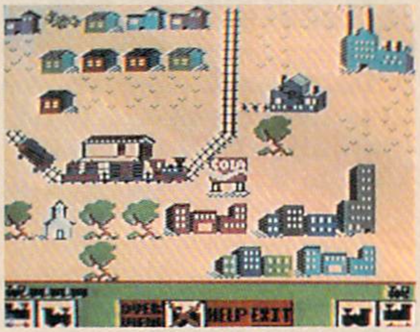
When the morph is ready, the manager heads for the Transmat. The players pick the terrain on which the battle will be fought and the exact nature of the contest. There are three different combats: a cooperative fight against a horde of invaders, a struggle to the death versus the other morph, and a contest much like "Capture the Flag." In the tournament mode, each manager choose one special rule such as "no chemical attacks" or "no surrender." The final step is to establish the number of victories needed to win the whole battle.

The battle starts on a multicolored strategic map of the selected battleworld. A solid square represents the location of each combatant. When these squares overlap, the display switches to a more detailed tactical screen for the actual fight.

The battle phase is a greatly elaborated version of the combat segment of *Archon*, which Reiche helped design. The manager moves a morph with the joystick and attacks by pressing the action button while pointing the stick in the desired direction.



The Railroad Works: *right on track.*
READER SERVICE NO. 274



Player can lay track, insert receiving and shipping sites, and landscape.

Boxes in the upper left and right corners report the status of each morph. Double-clicking the action button activates the features of the box which permit the morph to change weapons or use special abilities which would drain energy too rapidly if continuously employed. It is best to make these changes while the fighters are moving around the strategic map, because combat proceeds so rapidly that there's no time for such complicated moves.

Mail Order Monsters can be played head-to-head or against the computer. Those electronic managers are pretty savvy, better than many experienced human players.

The instruction booklet is very entertaining, but it's not always helpful. In spots, jokes overshadow the essential information about designing and fighting the morphs. A straightforward summary would have been a good addition.

Fortunately, most computerists will have little trouble getting the hang of *Mail Order Monsters*. If you're really stuck, watch the demo game for some hints on mechanics and strategy.

Memory limitations may have kept this very good game from attaining true excellence. The construction portion is excellent, but the battle phase could have used some elaboration. Combat is exciting and entertaining as far as it goes, but a wider range or tactics would have improved it.

Younger gamers are most likely to be attracted by *Mail Order Monsters*. The slam-bang real-time fights are sure to appeal to blast brigaders. While the design portion of the program is reminiscent of the way many kids play with action figures.

Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403 (phone: 415-571-7171). *–Arnie Katz*

THE RAILROAD WORKS
CBS Software
Commodore 64
Disk; $34.95

Just as the arrival of efficient diesels led to the end of the steam railroad era, the urbanization of America has crippled the hobby of model railroading. Oh, clubs and some rich individuals own and operate sprawling panoramas of miniaturized trains and scenery, but most folks just don't have the space. The typical city apartment doesn't even have room for a rudimentary N-gauge layout, much less the sumptuous setups of Lionel trains which were once a Christmas staple in department stores.

Just when you thought that gray engineer's cap had found a permanent home at the back of a closet, The Connelley Group has produced an electronic model railroad. The computerist can lay track, insert receiving and shipping sites, and landscape with scenery. There's enough room—12 screens—to construct the kind of dream layout which few railfans have ever owned.

The Main Menu offers eight joystick-selectable options. They allow the armchair engineer to construct a layout, operate it, play a railroading game, save a setup to disk, recall one from memory storage, clear the

screen or change from classic to modern rolling stock (trains).

"The Railmaster's Guide," the step-by-step documentation, wisely counsels would-be rail barons to sketch a track design before picking up the joystick. Plan in hand, the user picks "Construct" from the Main Menu to fetch the layout display.

The joystick controls the pointer which is initially located in the trainyard. Icons drive the construction process. Just move the pointer to the picture which symbolizes the desired activity and press the action button to implement the choice.

With the "lay track" icon engaged, the pointer becomes the railhead. The action button locks the pointer in place to lay a section of track. The builder sets the angle of the new piece relative to what's already in place and pushes the button to make the track section appear. The pointer automatically moves to the new railhead, which makes it easy to rapidly lay section after section.

There are no curved tracks, a major disappointment. Orienting a track 45 degrees from the piece behind it accomplishes the same purpose as a graceful curve, but isn't nearly as pleasing to the eye.

The four scenery icons work much the same way. Clicking one presents a menu of choices. The computerist puts the cursor over the desired building or terrain and hits the button to return to the layout. Moving the cursor to the desired location and pressing the action button positions the scenery. The user can repeat any selected piece of scenery by simply moving the joystick to a new spot and hitting the button. For example, repeatedly placing a picture of a tree creates a forest.

The "operate" option has an eight-icon control panel. This lets the model railroader control either of two trains and determine which one the omni-directional scrolling will follow as it navigates the trackage.

A throttle is a thin horizontal bar with "Reverse" on the left end, "Forward" on the right, and "Stop" in the middle. Side-to-side movement of the joystick pushes the throttle indicator in the corresponding direction. The further the engineer moves the indicator from the Stop position, the faster the train travels.

The game included on the disk is a fair approximation of the way model railroading clubs run their setups. An overall map shows the right-of-way and all potential shipping and receiving sites. A rectangle represents any business which might have cargo for your line to carry. The color of the box indicates how many cargos are waiting at each site. If you don't pick them up soon enough, the business ships by air instead, and the operator loses points.

The game isn't especially difficult, but it gives the computerist something to do with the transportation empire. It sure beats letting the train run around and around aimlessly.

The Railroad Works is right on track for all-family fun.

CBS Software, Greenwich, CT 06836 (phone: 203-622-2614).

–Arnie Katz

SUMMER GAMES II
Epyx
Commodore 64
Disk; $29.95 to $34.95

Light the torch and release the doves. Joystick-decathletes can enjoy a second helping of the only Olympic events nobody ever boycotts. Epyx has produced a sequel to their tremendously successful *Summer Games.*

The sequel presents eight new events, including the triple jump, rowing, javelin throw, equestrian, high jump, fencing, cycling, and kayaking. While spectators may consider some of these events a little esoteric, they are generally a lot of fun to play in this action strategy simulation.

The production values of *Summer Games II* are absolutely top of the line, even better than the original *Summer Games.* The lifelike animation of the well-drawn competitors dovetails perfectly with the excellent artwork. When an onscreen athlete fouls during the triple jump, his arms drop to his sides, his chin falls to his chest, and he walks a few sullen steps before stopping to



Summer Games II: ***eight new events.***
READER SERVICE NO. 275



Despite poor color-coding, the fencing event is a highlight of the program.

contemplate his inadequacies.

Special themes accompany the play of each contest. The design team has done an excellent job of capturing the special ambience of every event in music.

As in *Summer Games,* players can compete in one event or try them all in succession. A practice mode lets the gamer hone his or her skills. The most useful option found in *Summer Games II* may well be the opportunity to connect the two disks for a 16-event tournament.

The triple jump is one of the most difficult events on either disk. Learning to time joystick motions to execute a hop, skip, and jump in rapid succession is sure to tax anyone's reflexes. Until fingers master the proper timing, be prepared to foul repeatedly.

Rowing and cycling employ substantially the same visual presentation. In both cases, the screen is horizontally bisected into two large windows. Each of these mini-screens is itself divided in such a way that each player has a complete view, objective and subjective, of the action. When the contestants keep the race close, all four viewing windows remain occupied. Should one rower or cyclist build a big lead, however, distance

markers indicate the relative standing of the competitors.

The javelin toss is the first "throwing" event to be featured in the *Summer Games* series. The javeliner hits the button to trigger the release of the spear and points the joystick to establish the angle of flight. Too low an arc buries the javelin in the ground, while a cloud-buster doesn't yield enough distance.

Timing is everything in the high jump, which is faintly similar to the pole vault in *Summer Games*. The player sets the crossbar height prior to taking the leap and then attempts to take off at just the right spot to soar over the bar.

Kayaking is the pleasant surprise of the disk, an interesting, off-beat competition. Overhead perspective gives a bird's-eye of the one-man boats as they cut through the fulminating white water. The player sweeps the joystick back and forth to work the oars and steer the kayak through the numbered gates. The motion of the controller really conveys the experience of working the oars, because speed is secondary to maintaining the right rhythm.

The equestrian and fencing events are, unquestionably, the highlights of the program. The houseback-riding competition uses a complex joystick routine to spur the steeds into a canter and make them leap over the barriers. When the horse approaches one of the numerous jumps, the "rider" moves the joystick to the right and then quickly to the left before resuming full speed. Get too close to an obstacle, however, and the horse will stubbornly refuse the jump. And when that happens, all you can do is walk the beast back a few paces and try again. If the jump is not performed perfectly, the rider will be thrown from the saddle, losing more precious time.

The equestrian graphics are outstanding. There's a lush rustic countryside in the background and a variety of jumping obstacles, including ponds, posts, and gates.

Fencing is a positive joy, whether the player goes up against another human combatant, or faces a computer-controlled droid. An onscreen computer counts the hits, which makes it easy to keep track of the action.

The only drawback is the poor color-coding for the foils. Green and red seem silly choices for a pair of fencing foils, especially since the duelists wear white shirts. Darker colors would have contrasted much more effectively, especially considering the small size of the figures. It also would have been nice if the designers had included a beginner's difficulty setting for this contest. It's so demanding that some gamers will have a hard time even getting started.

These are only minor complaints about a game which covers itself with glory from the familiar opening ceremony to the closing festivities. Put simply, if you own a Commodore 64, this disk is a must.

Epyx, 1043 Kiel Court, Sunnyvale, CA 94089 (phone: 408-745-0700).

—Bill Kunkel



Computer Fireworks Kit: *a sparkler.*
READER SERVICE NO. 276

THE COMPLETE COMPUTER FIREWORKS CELEBRATION KIT

Activision
Commodore 64
Disk; $29.95

Two years ago, every new entertainment program was "the next *Pac-Man*." Now every new disk is a kit of some kind. It's this year's marketing buzzword in the software business.

Occasionally, though, something like this fireworks show reminds the computerist what started the rage for kits in the first place. *The Complete Computer Fireworks Celebration Kit* lives up to its name. It provides everything needed to construct a pyrotechnic display, including music and customized messages.

One of the utility options, "create," even makes a disk which can be played back by anyone with a Commodore 64. That's right, the recipient doesn't have to own a copy of the kit.

Despite a somewhat hazy set of instructions, *Fireworks* is remarkably simple to learn and operate. The Design Screen is so logically organized that it becomes nearly second nature by the time you finish your first show.

Everything, except writing the messages, is accomplished with the joystick. The stick moves the little onscreen hand from selection to selection, and the action button locks in the desired choice.

The Design Screen functions are arranged in vertical columns. Along the extreme left edge of the display are the utilities. These can play a fireworks show, save one to disk, load shows from disk for replay, initialize storage disks, make sendable display disks, present the menu of 20 songs, transfer melodies created with Activision's *Music Studio* to the kit, or pick one of six background scenes.

A system of frames is the heart of this program. The fireworks fan builds the show in somewhat the same way as an animator produces a cartoon, one cell at a time. Thankfully, the program takes care of all the little details.

The gray frame area occupies about three-quarters of the screen. Horizontal dotted lines divide the area into individually numbered frames, each of which represents the opportunity to program one effect. A narrow control band along the left edge of the frame strip enables the computerist to insert a blank frame, delete the current one, or simply change it to something else.

Once the frame is blank, the first step is choosing the type of effect which should be located there. This can be an airborne or ground-based pyrotechnic, the start or end of a song, a message, a cue to repeat a sequence, a dramatic pause, or a timer which varies the interval between explosions.

Next, the player moves the pointer to one of the variables in the frame's sub-menu. The exact nature of the

choices depends on the type of effect, but the designer gets to pick the screen location, color, and duration.

Hitting the action button when it's next to a sub-menu variable shifts the pointer one column to the right. The user moves the stick left or right to adjust the factor. Most factors are represented by horizontal status bars.

The composer can either estimate each bar by eye or check the gauge at the top of the screen for a numerical value. This makes it much easier to do things like having three roman candles detonate at the same height.

To see the whole display at any time, move the pointer to "play" and hit the action button. The Show Screen appears, and the fun begins. When working on a fireworks exhibition, it is sometimes helpful to see only a small portion of the total production. The "from" option starts the replay from the frame which is visible at the top of the screen.

The music included with the program is arranged in four groups of five tunes each. The player simply programs a song-start in the desired frame and then chooses the desired song or group. The renditions aren't the best ever heard on a Commodore, but they're more than adequate.

Messages can be inserted at any point in the display, subject to aesthetic considerations. The words can either pop into view or scroll across the screen from right to left.

The toughest part of designing a fireworks display is coordinating the timing of the various effects. A combination of pauses, time-delay fuses, and status bar adjustments can produce a slick-running finished display, but the fine-tuning procedure does tend to get laborious.

Playability is the strongest suit of *The Complete Computer Fireworks Celebration Kit.* Unlike most games, this creative pastime can't be mastered. This program can be used again and again, and in the hands of a creative composer, it will nearly always produce something fresh and delightful.

Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94043 (phone: 415-960-0410). *—Arnie Katz*

SUPER BOWL SUNDAY

The Avalon Hill Game Company
Commodore 64
Disk; $30

The Super Bowl may be well on its way to becoming a legal holiday, but the annual National Football League showdown is not a favorite of gridiron purists. Even leaving aside the monumental hype which precedes the game can't disguise the blunt truth: too many Super Bowls have degenerated into one-sided slaughters.

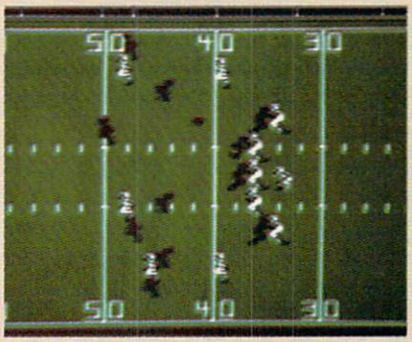
Maybe the next time one team blows the other out of the stadium before half-time, they ought to consider finishing the game on a Commodore 64. *Super Bowl Sunday* can't prevent one side from trampling the other into the turf, but it's generally faster-paced and more exciting than the real thing.

The program disk includes 10 Super Bowl match-ups, from the first game to the Miami v. San Francisco clash of 1985. (The person who did the team selection menu forgot that the Super Bowl takes place in January, so the listed years actually refer to the year in which the season started.) One or two computerists can either replay an actual Super Bowl or pair teams from different years for a "what if?" confrontation.

Super Bowl Sunday is a statistical replay simulation of professional football. Each player is a mathematical model which accurately reflects that athlete's performance in the season on which the simulation is based. When a compu-coach calls a pass from Joe Montana to Dwight Clark, the chances of success are the same as when San Francisco's Bill Walsh tries the same strategy in a game. Of course, the ability and positioning of the defenders has an effect, too.

The Main Screen appears prior to the start of every play. It contains a quarter-by-quarter score, time remaining in the quarter, the down, yards-to-go for a first down, the position of the pigskin on the field, and a summary of the just-completed play. One omission: nothing indicates which team has possession.

Super Bowl Sunday shines on defense. The coach can blitz any or all



Super Bowl Sunday: ***3 modes of play.***
READER SERVICE NO. 277

linebackers, key on either running back, use a six-man line in short-yardage situations, insert a fifth defensive back on sure passing downs, and double-cover receivers.

The defense begins each play by picking its strategies from a pair of menus. The first screen determines whether the defensive formation will anticipate a run or a pass. The next contains the list of options mentioned previously.

Manpower limits how many special moves a team can make. A lineback who's running the pass can't also drop back to double-cover the split end. The program doesn't tell the coach when he or she has chosen conflicting tactics. The absence of any form of feedback is frustrating and leads to annoying errors.

After the defense clears the screen, the coach of the offense chooses a play. There are four running plays, three types of passes, a quarterback sneak, punt, and field goal. You can even order the quarterback to fall on the ball to eat up the clock.

The formation screen appears next. The team with the ball can use a conventional pro set, a three-back "full house," or a four-receiver setup.

The coach selects the personnel who will actually execute the play. *Super Bowl Sunday* reflects the way NFL teams use situational substitutions. Any player can enter the game to participate in a play. Since the defense keys or double covers a position, not a specific player, free substitution can't be used to give the offense an unfair advantage.

After both teams input their signals, an overhead view of the field replaces the menus. Each team is represented by a full complement of 11

players. The marvelous animation endows the graphic screen with a surprising degree of realism. It's exciting to watch each play unfold, with its fakes, blocks, tackles, and broken-field runs.

The trimmings are as good as the game they embellish. Either coach can view line or backfield matchups by hitting the "L" key. *Super Bowl Sunday* maintains individual player statistics throughout the game, updating the numbers after each play. Coaches can check this data during the game or print it out for subsequent study and analysis.

Perhaps the most useful option varies the duration of a quarter. Fifteen minute periods produce a regulation-length game. The 5- or 10-minute choices are ideal when you don't have an hour for a full game.

Super Bowl Sunday has three modes of play. One gamer can play against a savvy robot coach, two humans can go head to head, or everyone can just sit back and watch autoplay. The latter version produces a replay which exactly follows the real-life coach's play-calling pattern. If Dan Marino threw an average of 40 passes per game during the season, that's exactly what he'll do in autoplay.

The game's biggest omission is that the players can't be switched between teams to create customized squads. This makes *Super Bowl Sunday* unusable for draft league play, though a circuit with stock teams works just fine.

Avalon Hill plans to release supplemental disks containing additional teams which can be used with the game. The first one will present teams based on the 1984-1985 season.

Super Bowl Sunday is a championship caliber pigskin simulation.

The Avalon Hill Game Co., 4517 Harford Rd., Baltimore, MD 21214 (phone: 301-254-5300).

—Bill Kunkel

ALCAZAR: THE FORGOTTEN FORTRESS

Activision Commodore 64
Disk; $29.95

Deep within a mazework of ancient ruined strongholds lies the oldest and most guarded ruin of all—Alcazar, the forgotten fortress. Many stouthearted souls have sought to unlock its musty secrets and carry off a priceless treasure. None have returned. To survive the journey takes skill, tenacity, and a healthy dose of luck.

This action-adventure combines elements reminiscent of the old *Venture* with a few tricks from illustrated text games. The player becomes a hero who must travel the dangerous route to the dreaded Alcazar.

A small flashing cursor represents the adventurer's current position on the map of the countryside. A network of roads connects the many small castles which dot the landscape. Alcazar lies at the extreme right edge of the map, far from the starting point of the quest. The hero must survive journeys through smaller strongholds before assaulting the prime citadel. The ultimate goal is to find the throne in the well-protected crown room inside Alcazar.

The color of a castle provides a clue about its contents. A resourceful explorer can find useful equipment and provisions scattered throughout the rooms and corridors of blue castles, guarded by tigers, griffins, tarantulas, and flies. In a purple castle, the monsters range from oil amoebas to the ever-present spiders and flies. Extra lives are the main treasure in a black castle, though the hero must successfully face all the terrors of this deadly realm to gain them.

When a player enters a castle, the display changes to a bird's-eye view of each room and hallway. When the hero walks through a door, the screen blacks out for a split second before the new room appears. It's wise not to charge through entrances too quickly, though. Pit traps are plentiful, and it's a *long* way down!

Much of the mental challenge in this joystick-activated adventure comes from discovering how to handle the various guardian creatures. Each monster has a different strength, and many of them are only vulnerable to specific modes of attack.

Uncharacteristically for a fantasy game, the hero begins the quest armed with a prosaic handgun. It's only a six-shooter, so it's important to fire as infrequently as possible during the early stages. Replacement pistols and new, more exotic armament like burning oil and bleach, both effective against certain supernatural beasts, must be found in castle corridors.

Greed is counterproductive, since the hero can only carry four items at a time. The player uses the controller's action button to scroll through the inventory of possessions and pick the appropriate one for any given situation.

The player's movement through a castle draws a small map at the bottom of the screen. A white square represents an explored room, while unexplored rooms remain green. A blue dot marks the hero's present location. The map isn't detailed enough to furnish much aid. It's just about impossible to use it to find specific locations, though it can help determine the route to the exit.

The hero's hair turns bright red if he becomes weakened. That's a cue to leave the current castle as quickly as possible, because a monster attack at this juncture is almost invariably fatal.

Some treasures extend the hero's capabilities. For example, a raft lets the quester cross otherwise impassable bodies of water. A ring allows heroes to use one of the two flashing magic carpets on the outdoor map.

The beautifully written theme song shrouds *Alcazar: The Forgotten Fortress* in mystery. This is fortunate, because the visuals, while above average for this type of program, aren't really detailed enough to establish a definite mood.

Action adventures like *Alcazar* offer an enticing blend of mental and physical stimulation. The player gets to exercise the gray cells on an assortment of tricky situations and the trigger finger against a legion of monsters. *Alcazar: The Forgotten Fortress* is an electronic passport to hours of entertainment.

Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

—Tracie Forman Hines



Sing Along With Your Favorite **Christmas Carols**

and **Party Songs**

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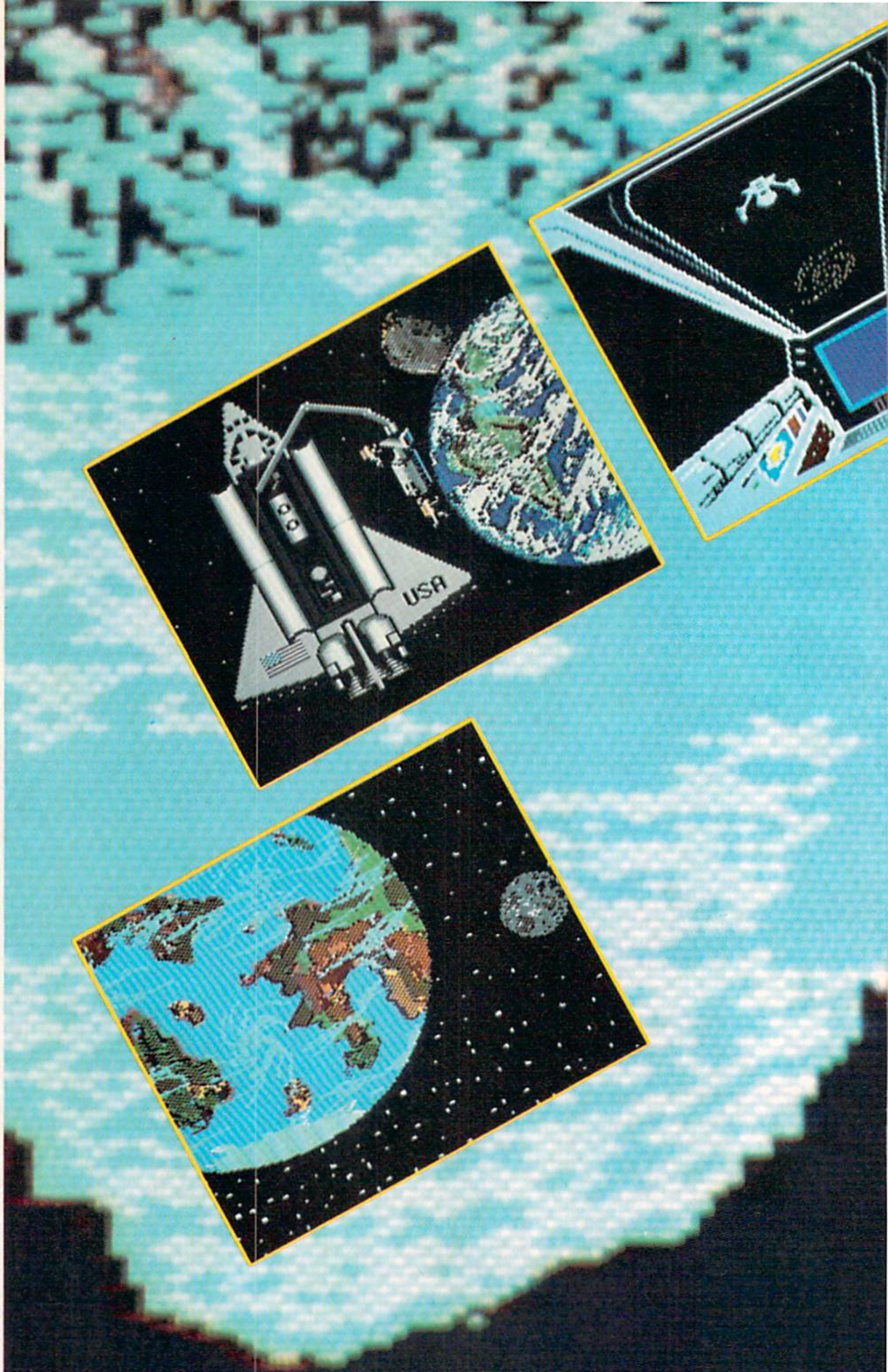
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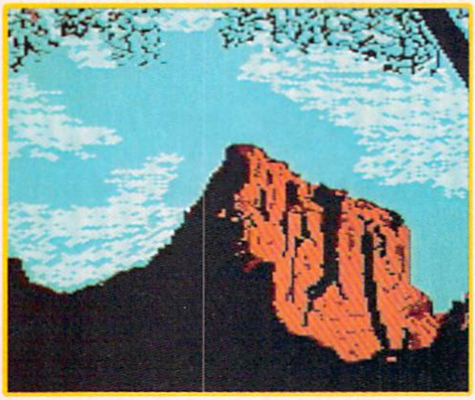
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ART GALLERY DISK SALE

Art Gallery images are now available on disk. High resolution bit-mapped images are available in *DOODLE!* format. Multicolor bit-mapped images are available in *Koala* format. Each disk includes a slide show program for easy viewing. *DOODLE!* disks include a bit map screen dump utility for the 1525 or properly interfaced dot matrix printer. *Koala* disks include a set of custom routines for bidirectional conversion to other multicolor formats. The conversion routines were expressly developed for the *Art Gallery* by Michael Beutjer of K.T. Software, author of the *Koala Printer* program and *Quad Print* (June '85 *Ahoy!*). Formats presently supported are *Cadpic, Peripheral Vision, Paint Magic,* and *Flying Colors.* Disks are available for $15 from Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229. Send a stamped and self-addressed envelope for a complete listing.

Contributors to *Ahoy!'s Art Gallery* will receive royalties based on the sale of disks. Send your best work on disk, accompanied by a stamped and self-addressed mailer, to Morton Kevelson, P.O. Box 260, Homestead Station, Brooklyn, NY 11229. Indicate the drawing package that was used to create the image. If you employed a bit map of your own design, indicate the appropriate file parameters, i.e., hi-res or multicolor, location of bit map, screen or color data.





Exactly 16 years and 4 months ago, man landed on the moon. And to commemorate the anniversary, we've devoted this edition of *Ahoy!'s Art Gallery* to space travel. The exception is *Watchman* by Mark Richey (Boulder City, NV), forming the background for this month's selections and shown unobscured at left. All of this month's images were rendered on *Koala*. *Top row: Shuttle* by Don Cadle (Riverside, CA) and a screen from *Spaced*, an original game by Robert G. Geiger (Anchorage, AK). Characters in the latter are all sprites programmed with techniques gleaned from the book *Commodore 64 Color Graphics: An Advanced Guide* (Arrays, Inc.). *Middle row: Porozlo, ATV-5,* and *Guardbot* by Armand Suarez (New Iberia, LA). *Bottom row: Spacecrew* by Michael Montauck (Brooklyn, NY). Inset in the mountain is *Submarine* by John Matthews, Jr. (not strictly conforming to our space travel theme—but man had to learn to sail through the ocean before he could sail through space). This last was created by digitizing an image with the Computereyes video acquisition system (see review in the September '85 *Ahoy!*) and adding finishing details by hand.


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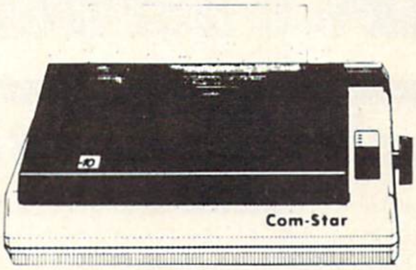
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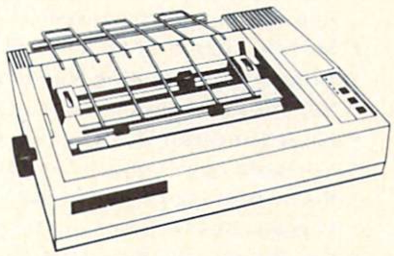
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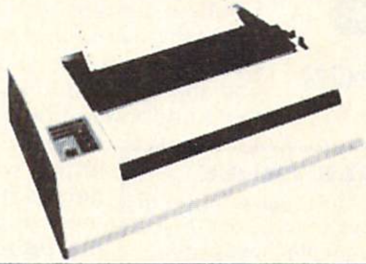
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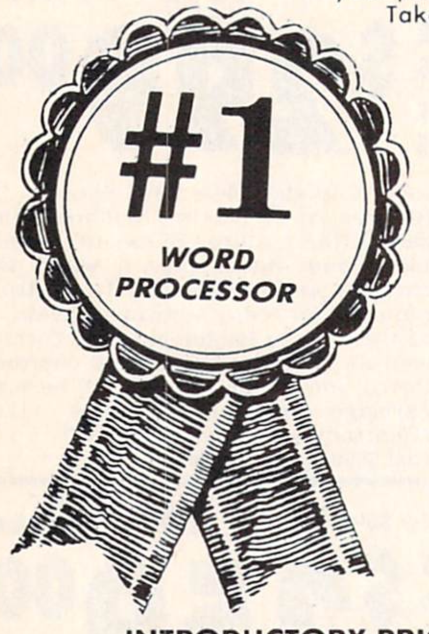
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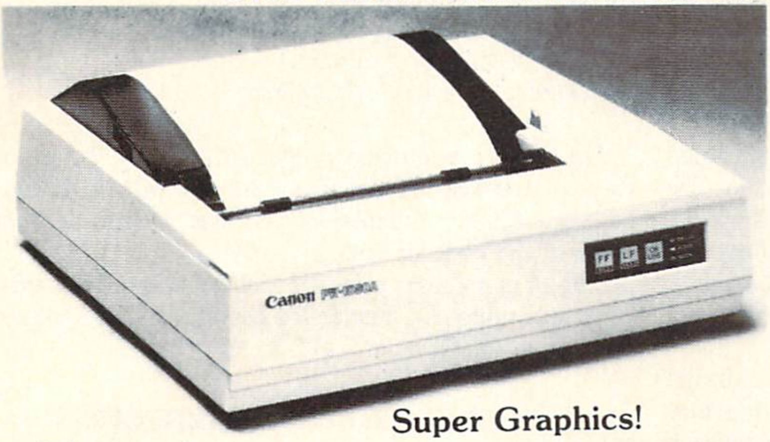
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FILE SCOUT

For the C-64

BY DON LEWIS

File Scout is a file logger utility for the C-64 and 1541 disk drive. It provides both screen and printer output of the most important file parameters for PRG, SEQ, and USR file types. It does not log REL file types.

The structure for the various file types is explained on pages 66-68 in the 1541 reference guide. Each file is composed of a series of sectors, linked together by pointers. The first two bytes of a sector point to the next track and sector associated with the file. The DOS built inside the 1541 uses these pointers as a road map to accessing the information in a file.

Unique to PRG file types is the load address, stored as bytes number 4 and 5 in the first sector of a file. The 64 uses this data to tell it where in memory to store the data in a file. For a BASIC program, the load address is $0800 (2049 in decimal). Other common load addresses you might see are $C000 (49152 in decimal) and $CC00 (52224 in decimal).

File Scout has a very convenient user interface. It first prompts you to insert a disk, then reads the directory from the disk, and extracts the number of blocks in each file, the beginning track and sector, and, for PRG file types, the load address.

Eight file entries are displayed per screen. At the bottom of the screen is the command line. The following commands are available:

NEXT–advances to the next eight file entries.
SCOUT–traces out a file's track and sector links.
PRINT–hardcopy log of files. See sample below.
BOOT–restarts the program.
QUIT–exit to BASIC (READY).

The PRINT command produces hardcopy. I have a Cardco interface with an Epson MX-80 printer. If you have a different combination, you may need to rewrite some of the code in lines 800-899.

I log all of my disks using *File Scout* and keep the hardcopy in a three-ring binder for easy access. A sample printout is shown below.

SAMPLE *FILE SCOUT* HARDCOPY

```
FILE SCOUT          FS # FILES :  4
BLOCKS ALLOC:  89 BLOCKS FREE:  575

FILE               TYPE TRK SEC BLK ADDR.D ADDR.H

FILE SCOUT V0619   PRG 17   0   21   2049  $0801
FILE SCOUT COPY2   PRG 17   19  21   2049  $0801
C/FILE SCOUT       PRG 19   0   34   2049  $0801
FS.DOC             SEQ 20   8   13
```

The SCOUT feature traces out the track and sector links for a particular file. If SCOUT is selected, you will be prompted for a file name. A wild card(*) is supported. *File Scout* will then trace out and display the file's track and sectors in the order they would be accessed by the DOS. I have found this to be very useful in saving mangled disks, or modifying programs right on the disk using a good sector editor.

Thirty-four links are displayed per screen. At the bottom of the screen a secondary command line is displayed. The commands are:

NEXT–advances to the next screen of links.
PRINT–hardcopy of track and sector links.
RETURN–return to main *File Scout* screen.

Because *File Scout* is written in BASIC, it tends to be a bit sluggish in its performance. If you compile it with *BLITZ!* or another BASIC compiler, its performance is dramatically improved. ☐

SEE PROGRAM LISTING ON PAGE 139

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PRODUCTS YOU CAN BELIEVE IN

Reader Service No. 133

THE KNIGHT'S TOUR

For the C-64

BY RICHARD RAMELLA

A sprightly sprite of a chess knight challenges you to a thousand-year-old puzzle.

Put a knight on any square of an otherwise empty chess board. Making only legal knight moves, occupy every square once but no more. It's called *The Knight's Tour,* and it has charmed and vexed generations since the Middle Ages.

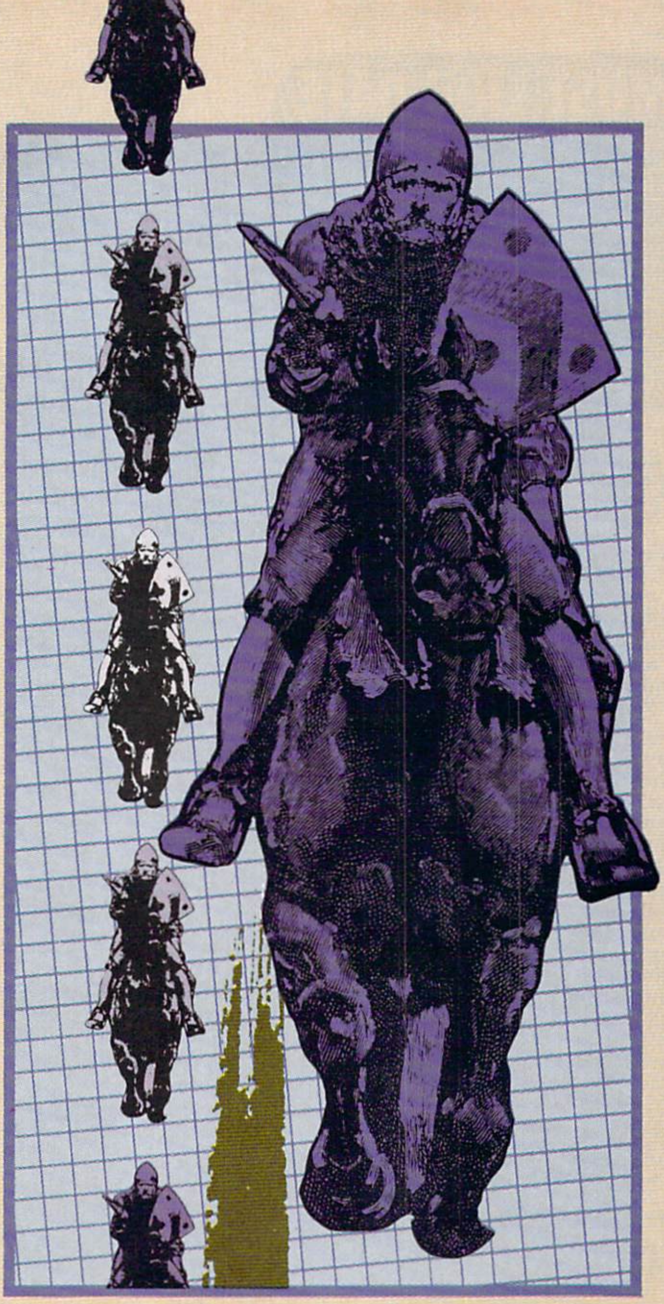
As a Commodore program, the knight is a sprite which can be moved around the board. Score is kept automatically. A perfect score of 64 is difficult. Program logic denies illegal moves: those other than the peculiar L-shaped gait of the knight, and those which would take the knight off the board or onto a square covered earlier.

When the program is run, a chess board is drawn. It has all open squares. At the northwest square is the knight. To take this playing piece to the square from which you want to start play, press the A key for north, Z key for south, comma key for west, and period key for east. At this stage it will travel freely in all directions.

On arriving at the chosen start square, press key K for knight. From this point you must make only legal knight moves. Use the directional keys to go one square in one direction and two in another (or first two squares, then one). Each square occupied will fill with a pattern and may not be entered again. Attempted illegal moves take the knight back to the square it just left.

Beware of leaving inaccessible squares and of moving the knight into a square from which no next move is possible. If this happens, the game is over. To play again, press the RUN STOP key and run the program once more. □

SEE PROGRAM LISTING ON PAGE 141



INSTANT BUG REPELLENT

For the C-64

BY KEITH JONES

For readers who prefer to correct their typing errors as they go along, I've created the Instant Bug Repellent. Instead of generating a list of Bug Repellent codes after you've finished entering the program, it will provide you with the code for a particular line immediately upon entering that line. Just hit RETURN and the *Bug Repellent* code and line number are printed at the top of the screen.

The program itself is a machine language program in BASIC loader form. The program begins at memory location 49152 in decimal and at $C000 in hex. To deactivate the program type: POKE 770,131:POKE 771,164 and hit RETURN.

Instant Bug Repellent uses the BASIC warm start vector to turn control over to the program. First it checks the locations $14 and $15 for the line number that was just typed. It then flips through BASIC memory for the line. When it finds the line, the program calculates the *Bug Repellent* and displays it at the top of the screen.

After you have typed in *Instant Bug Repellent*, save it to disk or tape. Then you may run the program to see if it has been typed in correctly. The words INSTANT BUG REPELLENT should then appear with a ready message. Next start typing in your program; your *Bug Repellent* codes should appear at the top of the screen. If the code is different from what is in the magazine listing, check the line and make any necessary corrections.

Sorry, VIC users—*Instant Bug Repellent* works only with the 64. □*SEE PROGRAM LISTING ON PAGE 125*

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Reader Service No. 257

LIGHTNING LOADER

For the C-64

BY DAVID ROSCOE

Lightning Loader is a machine language fast loader program that will load your BASIC and machine language programs up to five times faster than the usual load time. The program resides in memory from 51456-52224 ($C900-$CC00). Any programs that might load into these memory locations will clash with *Lightning Loader.*

Lightning Loader is entered using *Flankspeed* (see page 122). After you have typed in and saved *Lightning Loader,* reset the computer by turning it off and then on. Then type LOAD "LIGHTNING LOADER",8,1. Next type SYS 51456 and hit RETURN. After a short delay, "READY." should appear on the screen. This will tell you that *Lightning Loader* has been activated, and you are now ready to Lightning Load your programs.

You have the option of either loading your programs using *Lightning Loader* or, if you prefer, loading them as usual. To Lightning Load a program type QLOAD "progname",8. You may use "QLOAD" just as you would use the "LOAD" command. The load times for smaller programs is not greatly reduced. The larger the program is, the faster it will load. ☐

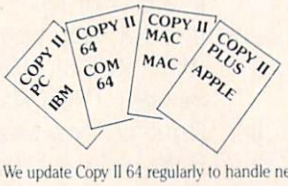
SEE PROGRAM LISTING ON PAGE 144

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Reader Service No. 115

If you don't read
page 77
you will be missing
Ahoy!'s newest
addition.

RHYTHMIC BITS

For the C-64

BY DAVID BARRON

By now, most people realize that computers play an important part in today's music. Current synthesizers are nothing more than dedicated computers. Even general purpose computers such as a Commodore 64 can be used as musical instruments, as shown by many previous articles in *Ahoy!* as well as assorted software packages. Most of these deal with the synthesis of melody; that is, the generation of a tune. What *Rhythmic Bits* deals with is the production of music's other key element, rhythm.

The program I am presenting allows for the definition of rhythmic sounds and their playback in a certain pattern. The program is menu-driven and fully self-documented, but to make things a bit clearer I will describe all the major parts.

Sound Definition—allows you to describe the type of sound you want included in your rhythm pattern. There is provision for eight sounds (zero through seven). You have control over three parameters: frequency, decay, and waveform. The frequency of the sound controls how high or low the pitch is. Be patient when modifying this, for the control responds slowly, but with great accuracy. Decay controls how fast the sound fades out after the initial sound is heard. A short decay gives a very percussive sound, while a long decay gives a more drawn out sound. The waveform option allows you to choose either triangle, sawtooth, or noise. The triangle and sawtooth waveforms produce a tone, with the sawtooth's being a bit harsher. These can be used for bell noises, or, with the frequency set low, a bass drum. The noise waveform produces noise that can be used for snare type sounds.

Pattern Entry—used to enter the rhythm pattern you wish to hear. When in this mode the screen will have a 32 by 8 grid on it. This is a representation of sound versus time. The eight vertical divisions represent each of the eight sounds you can define. The 32 horizontal spaces represent 32 divisions in time. This represents one measure that is repeated over and over when you play back the pattern. To select when a particular sound is to occur, simply place a marker in the corresponding time/sound spot. The only limitation is that for each time slot a maximum of three voices can be selected. This is because the SID chip only has three oscillators. One note: when you first enter this mode the screen may be filled with random nonsense. Simply clear this using the clear option.

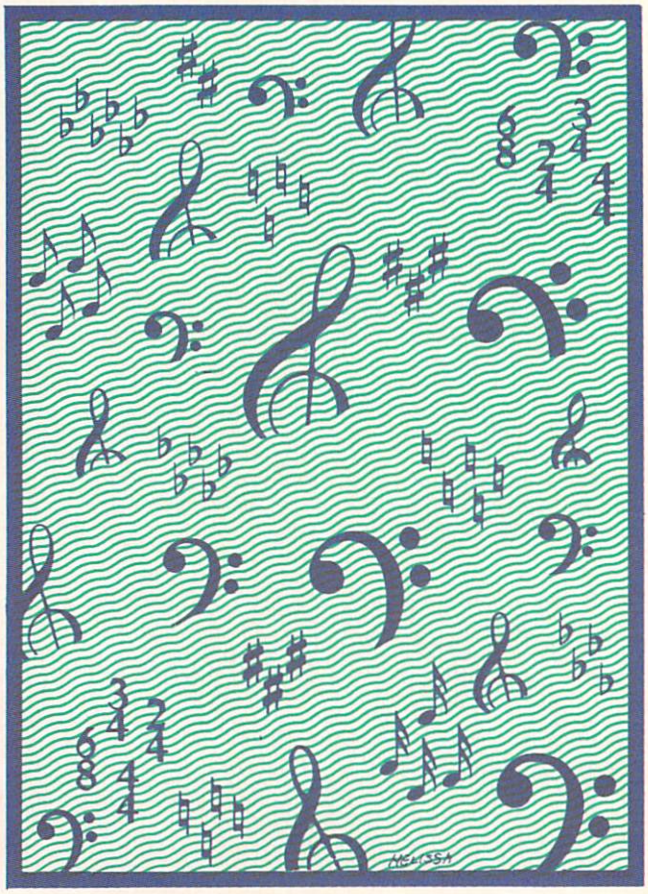
Filter Setting—functions as what could best be described as a tone control. A higher setting will give a harsher sound, while a low setting will give a more mellow sound.

Speed Setting—as its name implies, this sets the speed of playback for the pattern. If this is set too fast, the pattern becomes distorted and dissynchronous, so be careful when using it.

Playback—after all the sound and pattern definition is done, here is where it all pays off. Select this option and you will hear your creation. To stop the playback, hold down the space bar until it stops. You may then change whatever needs fixing by going back to the various menus.

That's all you need to know. The real fun of this program comes in experimenting with it. Don't be surprised if one day you spot your Commodore on MTV. ☐

SEE PROGRAM LISTING ON PAGE 142



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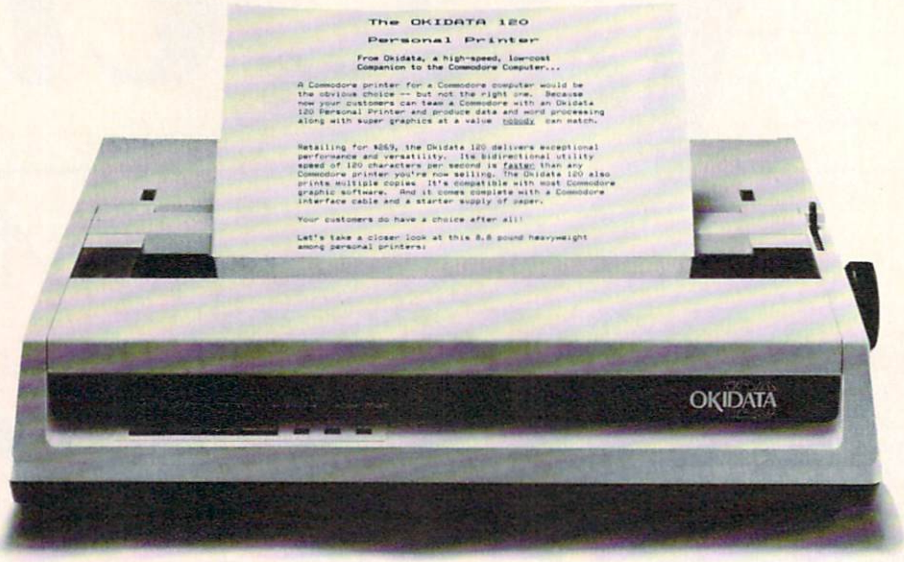




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THE MUSIC SHOP FOR MIDI

Passport Designs, Inc.
Commodore 64
Disk; $99.95

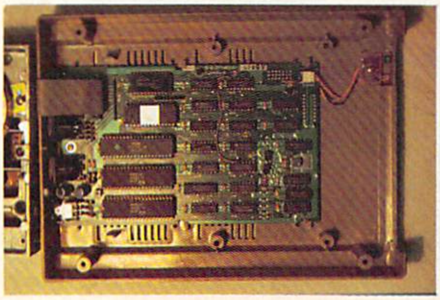
The Music Shop has proven to be one of the better music packages for the Commodore 64. Passport has taken this program one step further, adapting it for use with MIDI-equipped synthesizers. To use *The Music Shop for MIDI* you will need the Passport MIDI Interface Card, available separately. Additionally, the program will not work unless it is hooked up to a synthesizer. The MIDI version will use files created by the non-MIDI version.

The MIDI interface is about the size of a typical game cartridge, and plugs into the cartridge port. It has three short wires with DIN sockets on the ends. These are for MIDI-in, MIDI-out, and drum sync. The MIDI-in and out go in daisy chain fashion to any MIDI keyboards and drum machines you may have. The drum plug provides the clock signals necessary to sync any non-MIDI drum machines.

All features of the program are unchanged from the earlier version (see review last issue). The only changes are additional menus for the MIDI features, falling under the TOOLS MENU. The first feature is the MIDI ON/OFF function. When this is in the on position, notes may be entered onto the staff using your synthesizer. This is *not* real time entry of the music. If you currently have a quarter note selected for entry and you hold a G on the synthesizer, a quarter note G will appear on the staff. If you hold a chord, that chord will appear. To change to a different note you will have to resort to the computer keyboard. There is no provision within the program to do any realtime recording. The sole intention of this program, as of the original, is to allow you to enter music on a staff and then have the computer play it back. The MIDI enhancement only



Useful, or necessary, for operation of The Music Shop for MIDI: *64, monitor, printer, drive, joystick, keyboard. Not shown: MIDI Interface Card. READER SERVICE NO. 280*



Motherboard of Enhancer 2000 drive. READER SERVICE NO. 281

makes it sound better.

The other MIDI menu is the SET-UP MENU. This one facilitates the distribution of the music on up to four synthesizers. Depending on the staff that you are using, you may be able to use either two or four synthesizers. With one type of staff you have a separate staff for each synthesizer. With others you assign a note to a specific synthesizer by pointing its stem either up or down. There are eight presettable SETUP MIDI menus, allowing you to change your synthesizer/instrument definitions numerous times within a composition. Depending on what type of synthesizer you are using, you may not be able to take full advantage of the multiple instruments. Some synthesizers are only capable of producing one instrument at a time. I tested this program using a CASIO CZ-101. This is capable of producing four instruments at once, and worked flawlessly with *The Music Shop.*

The Music Shop with MIDI is an excellent adaptation of the earlier version. If your only interests are entering music on a staff and having your compositions played back in multiple instruments, this program will serve your needs well. If, on the other hand, you require real time entry features, you will not be able to use this package.

Passport Designs, Inc., 625 Miramontes St., Half Moon Bay, CA 94019 (phone: 415-726-0280).

–David Barron

ENHANCER 2000 DISK DRIVE

The Comtel Group, Inc.
Price: $219.95

The first thing you'll notice about the Enhancer 2000—especially if you're short of desktop space—is its small size. At 10 X 7.3 X 2.5", its total volume is just under half of the 1541. The main reason for the drive's compactness is its externally located power supply.

Regarding compatibility with the 1541, most of the software tested worked perfectly, with the exception of some recent releases (including *Beach-Head II* and *The Music Shop*). Also, the drive did not work with the Epyx *Fast Load* cartridge. The Comtel Group informed us that while they were aware that the production model tested for this review was not 100% compatible with the 1541, newer models would be.



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Formatting time is about 22 seconds. The aforementioned newer models, the Comtel Group assures us, will be faster by 30%.

The drive door is a hinge type reminiscent of the older 1541's. It seemed rather fragile, foreboding jamming problems after long periods of use. Three indicator lights are located on the front: a green power light and an amber error indicator below the disk insertion slot, and a red drive in use light above the slot. On the back are the dual serial bus, power socket, and power switch.

Inside, the drive has two circuit boards, with the main board located below the drive mechanism. Four of the chips on the main board have sockets, so if it does become necessary to replace them, it would be fairly simple to do so. The drive mechanism itself is a JVC direct drive motor.

I found changing the device number of the drive quite easy. The cover must first be removed to expose the main board. The jumper block is located on the rear left edge of the board. Using a pair of long nose pliers or tweezers, one or both or the jumpers can easily be removed to give you the device number needed, from 8 through 11. If later you decide to change the device number back to 8, just place the jumpers back accordingly.

A bonus disk included with the drive contained 12 programs. Besides the usual array of diagnostic programs that come with a new drive were several useful utilities, such as *Copy-All64* (disk backup utility), *Disk Log-Printer* (gives you a printout of your disk directory), *Disk Doctor* (allows you to edit tracks and sectors), and *Change Disk* (for changing the device number of the drive via software). Two games, a mortgage program, and a computer quiz were also included.

The manual is similar to the *1541 User's Manual,* but contains slightly less documentation. Explanations are given of all available DOS commands.

The manufacturer includes a limited one-year warranty, and for an additional $35.00 you can extend it to a second year. Considering the lifespan of most 1541-compatible drives, I would recommend spending the extra $35.00 for the extended warranty.

I found the Enhancer 2000 to be an efficient workhorse with a very quiet operation. After four hours of continuous functioning in 90 degree temperature, it performing flawlessly. Though the drive's list price is $215.00, it is expected to sell in the $169-$189 range.

The Comtel Group, 1651 East Edinger, Suite 209, Santa Ana, CA 92705 (phone: 714-953-6165).

—Michael Davila

VIEWTRON

Viewdata Corporation of America, Inc.

"Viewtron? What's Viewtron?" It seems that every time I mention this new videotex service the response is the same. If you haven't heard of it by now, grab hold of your socks while I tell you what you've been missing!

Videotex is a type of system that allows information to be transferred between the host and the user as full color graphics. Through the use of its own special software, Viewtron offers the user access to a wealth of online information with every single page in full color.

What's offered besides pretty pictures? How about reviews and ratings of more than 600 pieces of Commodore software and hardware, with new reviews added every two weeks? It's not a one way street, either. They want to know what *you* think about the items mentioned. Plus, nearly every item reviewed can be ordered while you are online from a major mail order firm, at a discount.

If being able to order while online whets your appetite for more, you'll love the next feature. Viewtron has a special electronic auction that is open to all users. Many major brands are "put on the block" every day. The prices keep dropping every 15 minutes until the items are sold. It doesn't matter how low a price goes; the item stays until it's bought, even if it ends up selling for $1.00.

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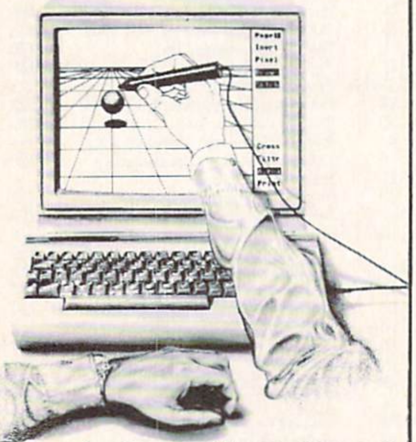
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After coming back from your vacation you might find yourself wondering about how the rest of the world fared while you were away. Flip on the computer and dial up Viewtron! World, national, and local news are available. (Viewtron's parent company is Knight-Ridder Newspapers, Inc., so you know you'll always have access to late-breaking headlines.) Sports news is of primary importance to many, and whether your sport is baseball, soccer, or auto racing, you can get full and accurate reports about any of them.

Perhaps, like many of us, you're watching your money carefully these days. By offering several "bank at home" services, Viewtron makes it simple. You can also get up-to-the-minute reports on the stock market, commodities, bonds, gold, and worldwide currencies. Information about the real estate market is also to be had.

Like a little entertainment after all this? Scan over to the games section. Many different games and quizzes are online, along with a self-test section that can help you learn more about the type of person you are. And with trivia all the rage nowadays, Viewtron was not about to be left out; its trivia section has questions geared to experts and beginners. The silver screen is not forgotten either. (That's movies to you youngsters.) Movie news, movie trivia, movie reviews, and even an Academy Awards quiz can be found.

Are you a soap opera buff? My wife is a devout fan of several, but finds it hard to watch both the shows and our children during the day. She generally tapes the shows and watches them after the kids are asleep, but what to do when the VCR chews up the last 15 minutes? Viewtron to the rescue! With a complete summary of each show posted daily we never have to worry about missing our soaps.

Some of you may be asking, "Gee, B.W., this sounds great, but how's the service? What if I have a problem?" Let me reassure you. Viewtron has the best customer service department it has ever been my pleasure to call! I cannot believe how friendly and willing to help they are. There are no delays or forgotten promises to "call you back" here. These people are professionals and it shows. It seemed to me that everyone I dealt with at Viewtron had a real and honest desire to help me in any way possible.

What does access to this amazing world of information cost? $9.95! That price includes a disk with the special terminal software needed to use the system, one free hour of service, an ID and password, and a user manual. Subscribers pay only for their use of the service. There are no monthly fees or minimum use charges. Connection rates are $.09 per minute weekdays after 6 p.m. and weekends, and $.22 per minute weekdays. There is no extra charge for use at 1200 baud. (Prices may vary in some cities.)

Viewdata Corporation of America, Inc., 1111 Lincoln Road, 7th Floor, Miami Beach, FL 33139 (phone: 305-674-1444). *–B.W. Behling*

MICROLINE 192 PRINTER
Okidata
$499.00

I have been using Okidata products as far back as the Microline 82A. They have established a reputation as a company that manufactures fast, dependable printers. The 82A was a 120 cps workhorse, and the 92A basically a "super" 82A; but the 192 is a quantum leap forward.

The housing for the 82A and 92A was far from sleek. They were big, heavy, and relatively noisy. The 192,

on the other hand, is slim, trim, and quiet. Housed in a tan plastic case (14.2"W X 10.8"D X 3.2"H), it weighs in at a mere 8.8 lbs. The first impression that this printer gives is that of a toy. I lost count of the people who saw it and asked, "Is it thermal?" Once this tiny powerhouse is activated, though, all skepticism is overcome.

Two primary text modes are available: Data Processing (DP) and Correspondence Quality (CQ). Print speeds are 160 cps and 33 cps respectively. If you were to race the 192 against another 160 cps printer, the 192 would win. This is because the 192 kicks into a 200 cps mode when it encounters spaces. If you were printing out two columns, the printer would output the data at 160 cps and speed up to 200 cps as it moved on to the next column. The CQ mode is one of the finest I have ever seen. I would consider it perfectly acceptable for all applications short of a resume. When in this mode, the printer uses a two-pass technique to print in a 17 X 17 matrix (DP mode prints in a 9 X 9 matrix). Additionally, in emphasized or enhanced modes the speed is 80 cps.

No fewer than 13 character sets are included, among them ASCII, no-slash zero ASCII, international sets, and an IBM character set capable of producing IBM graphics characters.

On ground equally high as the text modes are two graphics modes: APA, and Block. The Block graphics are standard TRS-80 graphic characters, but the real power lies in the APA graphics. This is the dot-addressable graphics mode. Available are six resolutions: 60 X 72, 72 X 72, 120 X 144, 144 X 144, 240 X 144, and 288 X 144 (all resolutions given in dots per inch). This variety is sufficient for almost any graphic application.

Besides the raw power of the printer hardware, this printer is a pleasure to use for two other reasons, namely the manual and the menu select mode. The manual is very well written. It will taken even the beginner through the setup and use of the printer. The menu select mode is a system by which the front panel

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We reserve the right to limit quantity purchases. **TOTAL**	$669.00	**$365**

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switches and interactive software within the printer firmware guide you through the printer options. As you select and change things such as print modes and character sets, the printer echoes your selections, making offline parameter changes a breeze.

One last feature is an 8K printer buffer. This is a good size, as it can accept up to medium size documents, freeing up your printer for other work.

The Okidata 192 is an excellent value for the money, and I recommend it for low and high end applications alike.

Okidata, 532 Fellowship Road, Mt. Laurel, NJ 08054 (phone: 609-235-2600). *—David Barron*

THE MACHINE SHOP

FS! Software
Commodore 64
Disk; $40.00 (see below)

Discussions on machine language programming are generally concerned with the creation of programs. Very little is said on the analysis or disassembly of machine code into a more readable form. There are numerous utilities available which support the creation of machine language programs. These range from simple machine language monitors to full blown macro-assemblers. The former will handle code just one instruction at a time. The latter support the creation of multi-kilobyte programs. Although machine language monitors will disassemble code one line at a time, they are totally inadequate for programs longer than a few dozen instructions.

As Commodore users we encounter machine language programs in great abundance. They are frequently used as subroutines to speed up critical operations that BASIC just can't handle. A tool to convert this code into a more readable form would be a great boon to anyone wishing to learn more about the subject. *The Machine Shop* from FS! Software is just such a product. It permits the creation of machine language programs from nearly standard MOS source code, as well as the reverse process.

The Machine Shop for the C-64 is not a new product. It is actually an updated reincarnation of *Develop-64*, one of the first assembler development systems for the C-64 and the VIC 20. Originally published by French Silk Smoothware, the company has been reformed under the name of FS! Software. The company's name derives from Don French, the proprietor, and the Jacquard loom. This device was the first to utilize a punch card program for the weaving of French Silk in the early part of the 19th century.

The package is actually two utilities which can be configured to interact in a most intimate fashion. The first is *Develop-64*, a full-featured Macro Assembler. The second is *Decode-64*, a three-pass symbolic disassembler and cross-referencer. It is the latter program which gives *The Machine Shop* its unique and powerful capabilities.

Decode-64 can analyze a block of data, in RAM or on disk, and generate a fully cross-referenced assembler source code file, complete with labels, for user analysis or for incorporation into a *Develop-64* source program.

The best part of the deal is that *The Machine Shop* does not have to cost you a penny. It is one of those rare "freeware" packages where the user pays for the program after having tried it out. Anyone who already has a copy is encouraged to distribute additional copies (of the disk only) to anyone else who might be interested. This is a complete turnaround from the copy protected original distribution of this package. If you like what you see, a $40 payment to FS! Software will get you the complete documentation for the package. You will also receive with your payment a one-year subscription to *Machine Code*, a new quarterly magazine for machine language programmers. The first issue is expected to be published at about the time you read this (Fall 1985). Note that FS! Software will only supply *The Machine Shop* as a complete package for the established price.

DEVELOP-64

This is the heart of the package. It is a full-featured macro-assembler which closely follows many of the

conventions of the original MOS Technology specifications for 6502 source code. It features an easy to use full screen editor based on the native editor of the C-64. As with the BASIC editor, line numbers are required. However, these are automatically generated. The user references the line numbers only when listing, inserting, or deleting lines. The editor also supports string search and replace, as well as block move and copy. The program performs syntax checking on each line as it is entered. This insures that the resulting source code listing will at least be syntactically, if not logically, correct.

Source code programs, in memory, can be up to 2200 lines long. This in no way limits the size of a complete program. *The Machine Shop* fully supports the disk drive. Any number of disk files can be linked up to the capacity of a single disk. In addition, *Develop-64* supports macros and library files. The former allow passing of up to eight parameters to the subroutines. The latter do not permit parameter passing.

Macros and library files in machine language are similar to subroutines in BASIC. They are standard blocks of code which you may use in many of your programs. Although they are not an essential feature for the writing of machine language programs, they are a great convenience. The macro feature allows the source program to call in these subroutines as required. The final code is assembled with the macro code as an integral part.

Interestingly enough, *The Machine Shop* distribution disk lacks a dedicated machine language monitor (MLM), even though there are a number of very good ones in the public domain. (Most other assembler packages we have seen include one of these MLMs.) *Develop-64* does have most of the MLM features built in. The Debugger function is extremely effective in this regard. This built-in utility lets you display memory 160 bytes at a time. The ASCII representation of the code is listed alongside the hex values. In single step mode the contents of memory

GUARANTEED SOFTWARE

NEW

VIZASTAR for the C128

Vizastar, the integrated spreadsheet, database and graphics program that has the Commodore 64 world raving, is now available for the C128. It boasts 80 columns, and has over 40K of free memory in the spreadsheet. Those who already own Vizastar 64 will be pleased to know that your existing files can be read by Vizastar 128. Also, you can upgrade to the 128 version. Call us for details and pricing.

"The only other comparable product would be Lotus 1-2-3 for the IBM PC; nothing in the C64 world comes even close to the features of Vizastar."
AHOY July 85

"I found Vizastar would do anything Lotus 1-2-3 could, and then some. It's my Commodore choice to become the standard against which the others will be judged."
INFO 64 Magazine, Issue #7

"Vizastar is an exceptional package that rivals the features of programs such as Lotus 1-2-3 and offers C64 owners the kind of integrated software previously only available for higher-priced systems."
RUN Magazine, June 1985

"I scrutinized, tested and experimented with Vizastar extensively, but could find no weaknesses whatsoever. It is the most comprehensive, most flexible, most powerful and easiest to use integrated software package I've worked with."
Commodore Microcomputer, Sept/Oct 1985

"I use an IBM PC at work with Lotus 123. I feel Vizastar is just as good and in someways better than 1-2-3."
Steven Roberson, NC. End User

"I have used Multiplan and Superbase; both are good pieces of software, but are inadequate when compared to Vizastar."
Jim Mathews, WA. End User

"So good, I bought a second C64 and Vizastar for my office. A wild bargain! You've saved me from having to buy IBM and Lotus."
Philip Ressler, MA. End User



NEW

VIZAWRITE CLASSIC for C128

This is the new word processor from Vizastar's author, Kevin Lacy and is the successor to Omniwriter, which he also wrote. All the features of Omniwriter are there, plus many significant enhancements, like auto pagination, on-line help, pull-down menus, full-function calculator and more. Up to 8 'newspaper-style' variable-width columns can help with newsletters.

Three different proportionally-spaced "near letter quality" fonts are also built-in for use with Commodore or Epson compatible printers. You can merge almost any other word processor file directly into Vizawrite, including Paper Clip and Omniwriter. Naturally, it is also compatible with Vizastar. At all times, what you see on the screen is exactly the way it will be printed out. Vizawrite can do mail-merges and has an integrated 30,000 word spelling checker that you can expand yourself.

PROGRAM SPECIFICATIONS

Both Vizawrite and Vizastar are written in 100% machine language and run in the 128's FAST mode, making it lightning fast. They require a C128 with 80 column color or monochrome monitor. Both come with a cartridge, a diskette, a backup, and a reference manual. Vizastar also includes a 50 page tutorial book. Both work with 1541 or 1571 disk drives.

RISK-FREE OFFER

Vizastar 128 is priced at $119.97. Vizawrite's price is $79.97, but as an introductory offer, it is now only $69.97. Vizastar 64 XL8 is now available for $119.97. We are so positive you will be satisfied with our programs that we offer a 15-day money-back guarantee. Try it Risk-Free. Call us today or send a check or money order. VISA/MC accepted.

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Reader Service No. 104

are disassembled one instruction at a time. The contents of all of the microprocessor's internal registers are continuously displayed and updated. The trace function disassembles code in a continuous stream while maintaining the control of the single step feature. Output can be directed to either the printer or the screen. Up to ten break or go points can be set for the trace mode.

DECODE-64

This program is the highlight of the package. It generates a fully labeled disassembly of a block of code from memory or disk. The output can be sent to either the screen, printer, or disk. In the case of the latter, the resulting source files can be directly used by *Develop-64*. The size of disk files are automatically limited to 2000 lines each. Labels are created following a predefined set of rules. Each label contains the originating address in hexadecimal or decimal. The latter are useful for referencing by BASIC's SYS cells. The labels also identify the calling instruction as to type. For example, a J indicates a JMP and an R indicates a relative branch. External references are also identified, as are all zero page references.

As we mentioned, *Decode-64* is a three-pass symbolic disassembler. This means that each disassembly is created on the third scan of the data. In the process a complete symbol table of all the generated labels is created. A useful adjunct to *Decode-64* is the built-in cross referencer. When activated, this routine scans the resulting source code symbol table. All labels are listed with every line number at which they appear. An asterisk identifies the line number which defines the label.

Not all machine code represents executable instructions. Many parts of a program are actually data such as screen messages, numerical constants, program vectors, and so on. Trying to disassemble these parts of the code will waste processing time at best and produce misleading and incorrect code at worst. *Decode-64* lets you mark off blocks of code as data not for disassembly. Up to eight such areas can be so defined.

It is up to the user to select the code for this restricted treatment. This can usually be done by a quick disassembly with an MLM. When a lot of illegal opcodes start to show up, this is most likely a data area. A simple memory scan will also serve to display any readable ASCII message blocks. The Debugger portion of *Develop-64* will do this job well.

Both *Decode-64* and the Cross Referencer can be merged with *Develop-64*. The result is a tradeoff where some features are enhanced while others are limited. Most significant is the ability to preassemble a label file which identifies some of the more common machine language calls in the C-64. For example, a complete list of all of the Kernal calls is included on the distribution disk. The symbol table created by this preassembly is kept in memory when *Decode-64* is used on an object program. All calls to the predefined symbols will be properly labeled in the resulting disassembly. The only significant limitation to the merged *Decode* and *Develop* utilities is the inability to mark off data areas in the object code.

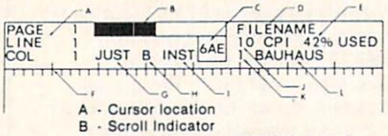
THE DOCUMENTATION

We had better go into some detail on this, as it may be the only part of the package you will be paying for. What you get will actually be two books. One of these is a 14-page pamphlet which describes the operation of *Decode-64* in some detail. Although quite readable by most software documentation standards, you will be well advised to run *Decode-64* through its paces as you go through the book. Nothing beats hands-on experience when learning a complex package of this sort.

The other book is a nine chapter, nine appendix volume called *Inside the Commodore 64* by Don French. Don't panic! The instructions for *Develop-64* are only a small part of this, appendices E and F to be exact. The first is a quick run through of its features, while the second takes care of



On Screen Status Display



A - Cursor location
B - Scroll Indicator
C - Print features currently being used
D - Filename of text
E - Percentage of RAM (memory) used
F - Ruler (also message line)
G - Word wrap/justification flag
H - 'Block marked' flag
I - Insert mode flag
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the details. Once again, keeping the program and computer at hand will be helpful.

The major part of the book is devoted to a detailed description of the hardware and software features of the C-64 as they relate to machine language programming. The chapters are about equally divided on the instruction set of the 6502/6510 microprocessor and the specific details of the C-64 environment. Emphasis is given to the operation of the C-64 graphics and sound chips. Conspicuous by its absence is a discussion of the C-64 I/O functions of the user or serial ports.

CONCLUSIONS

The Machine Shop in its present incarnation is definitely a best buy. If you have not yet selected an assembler/disassembler for your own use, you will not go wrong with this one. Rumor has it that something of a cult following has developed over the original issue of this package. At least one major text on C-64 assembly language has adopted *Develop-64* as the assembler for all the in text examples. *Assembly Language Programming with the Commodore 64* by Marvin L. DeJong is a 296+ page text on the subject available from Brady Communications (division of Prentice Hall).

FS! Software, P.O. Box 635, Faribault, MN 55021 (phone: 507-332-8122). *—Morton Kevelson*

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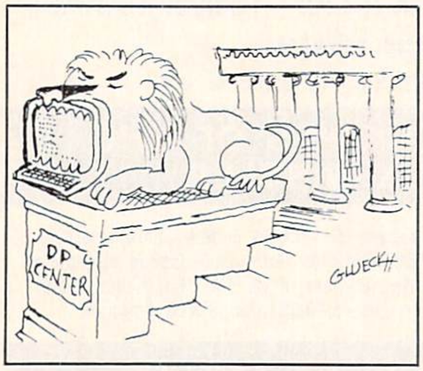
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If you'd like, this program will even print your checks automatically. I was especially fond of the "test print" feature that let me check the alignment of the checks in the printer. Although I began with a complaint about the speed of the C-64, you need to know that *General Ledger* can bring any account to your screen for review within 4 seconds. It does so by indexing information on the disk. The price you pay is a 16- to 20-minute wait (with a 1541 drive) while the program formats a new data disk and creates its files.

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Business Electronics Software and Technology, Inc., P.O. Box 852, McMinnville, OR 97128 (phone: 503-472-9512). *—Richard Herring*

COMMODORE ROOTS

GETTING GRAPHIC

ASSEMBLY LANGUAGE TECHNIQUES FOR GRAPHICS PROGRAMMING

By Mark Andrews

If you've ever tried to write a high-resolution graphics program and wound up frustrated by the graphics limitations of Commodore BASIC, agonize no more. In this and the next few editions of *Commodore Roots*, we'll explore some of the techniques professional assembly language programmers use to write arcade-style games and other kinds of graphics-oriented programs.

As you may know, the Commodore 64 has two primary screen modes: a text mode and a high-resolution graphics mode. In text mode, the C-64 is capable of displaying up to 1,000 characters at a time on its screen, arranged in 25 lines of 40 characters each. To hold the 1,000 characters, the 64 uses a specific block of memory exactly 1,000 bytes long.

This segment, called screen memory, normally starts at Memory Address 1024 ($400 in hexadecimal notation) and extends to Address 2023 ($7E7 in hexadecimal). It is often pictured as a grid of rectangles measuring 40 columns wide by 25 rows high, with each rectangle representing one character on the screen. Figure 1 is a map of the segment of memory most often used as screen memory in Commodore 64 programs.

acters, but a special set of screen codes that includes many characters not present in the standard ASCII character set. A complete list can be found beginning on page 132 of the *Commodore 64 User's Guide,* and on page 376 of the *Commodore 64 Programmer's Reference Guide.*

Once you know what these screen display codes are, and where the screen display memory in your computer is, you can print text and graphics characters on your computer's screen by POKEing their screen-code values directly into the appropriate addresses in screen memory. In this way, you can bypass your computer's screen editor anytime you like, and print anything you like directly on your screen.

In addition to its 1,000-byte block of screen memory, the Commodore 64 has a corresponding block of color memory. This segment of RAM begins at Memory Address 55296 (hexadecimal $D800) and extends to address 56295 ($DBE7 in hex notation). Color RAM, like screen RAM, can be visualized as a 40-column by 25-line matrix of rectangles, with each rectangle representing the color of one of the 1,000 characters that can be displayed on the C-64 screen. Figure 2 is a map of the block of

Figure 1: A C-64 Screen Map

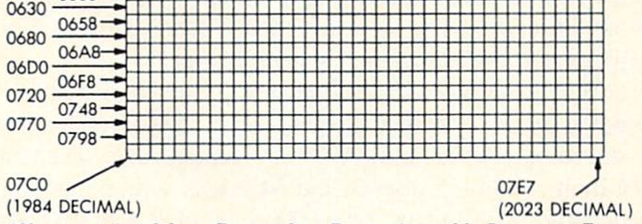
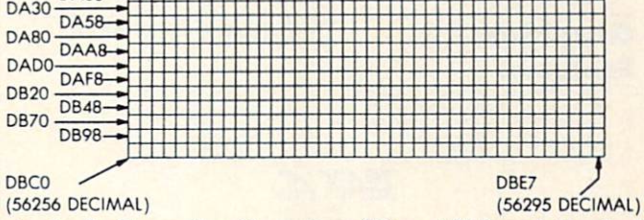


Figure 2: Map of C-64's Color RAM



(Charts reprinted from **Commodore Roots: Assembly Language Programming for the Commodore 64,** *courtesy of Howard W. Sams & Co., Inc.)*

When you type a character, your Commodore 64's operating system translates that character into a code, then prints the character on your screen by storing its code number in the appropriate screen-map location. The codes used for this purpose are not the standard ASCII codes which computers often use to represent typed char-

color RAM used by the Commodore 64.

When a character is to be displayed in a given color on the C-64 screen, the screen map illustrated in Figure 1 and the color map illustrated in Figure 2 are used together. First, the desired character's screen code is stored in the appropriate memory location on the screen map.

Then another code, which represents the color in which the character is to be displayed, must be stored in the corresponding memory location on the color map. Since both maps are exactly the same size–40 columns wide by 25 rows high–the color map can be thought of as a color overlay which can be placed on top of the screen map. Each rectangle on this color overlay can be displayed in 16 different colors–and when the code for a given color is stored in a given location on the color map, that is the color in which the character in the corresponding location on the screen map will be displayed.

The 16 colors that can be displayed on the C-64 color map–and the code numbers that are used to display those colors–are listed in Table 1.

TABLE 1

Commodore 64 Color Codes

Code Number	Color	Code Number	Color
0	Black	8	Orange
1	White	9	Brown
2	Red	10	Light red
3	Cyan	11	Gray 1
4	Violet	12	Gray 2
5	Green	13	Light green
6	Blue	14	Light blue
7	Yellow	15	Gray 3

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The short BASIC program titled BALLBOUNCE.BAS (see page 124) illustrates how the C-64 screen map and color map work together.

BALLBOUNCE.BAS is not a high-resolution graphics program; it uses the C-64's standard 40-column text mode. In Line 40, a loop is used to place a red overlay across the top two thirds of the screen–from the top line down to the line that begins at Memory Address 55976. When this red overlay is first put in place, it is invisible, since nothing has been drawn yet on the screen. But as soon as something is printed on the portion of the screen covered by the overlay, it will show up in red.

After the red overlay is in place, a yellow one is laid down. This yellow overlay is just one pixel high; it runs across the screen horizontally. In the BALLBOUNCE program, this overlay is used to draw a yellow line: the line that represents a floor (or the ground) as a red ball goes bouncing across the screen.

Once the red and yellow overlays are in place, the words "FOLLOW THE BOUNCING BALL..." are printed in white across the top of the screen. Then, in Lines 210 through 240, the ball is animated. The animation technique is crude, but quite effective; PRINT commands are used to erase the ball and redraw it as it bounces across the screen.

A HIGH-RES GRAPHICS PROGRAM

A more sophisticated technique for creating screen motion is illustrated in the program titled BLACKBOARD.BAS on page 124. Like BALLBOUNCE, it is written in Commodore 64 BASIC. But, unlike BALLBOUNCE, it is a high-resolution graphics program. The BLACKBOARD program clears a section of memory that will be used as screen memory, and then it draws a pair of crosshairs on the screen using high-resolution graphics. But it does this job very, very slowly, clearly illustrating the snail's pace at which BASIC usually executes high-resolution graphics programs.

Here's how BLACKBOARD.BAS works:

The C-64, as pointed out earlier, has two primary screen modes: a text mode and a high-resolution graphics mode. In the latter, the 64 produces a screen display that measures 320 dots (or pixels) wide by 200 dots (or pixels) high. That's a total of 64,000 separate dots, each one of which requires one bit of memory. So it takes 8,000 bytes of memory to produce a high-resolution screen display.

When the 64 is in its high-resolution mode, it does not generate a screen display using ASCII characters stored on a 40-column by 25-row screen map. To create a high-resolution display, the 64 uses a screen map that occupies 8,000 bytes, or 64,000 bits, of RAM. Each of these bits can be individually controlled by the programmer. If a bit is on, the dot that it controls will be lit. If a bit is off, the dot that it controls will be dark.

High-resolution screen maps can be placed in various memory blocks (the reason this is true will be explained in a later column dealing with memory management). Colors are controlled by "overlays" in high-resolution

graphics, just as they are on a text screen; the subject of screen colors will be covered later in this column.

Since one bit equates to one dot in high-resolution graphics, plotting the position of a dot wouldn't be difficult if the high-resolution screen were laid out using straightforward X/Y coordinates. Unfortunately, that is not how high-resolution screen plotting works on the C-64. Instead of being arranged as a matrix of dots 8,000 dots wide and 8,000 dots high, the 64's high-resolution screen is laid out exactly like a text screen: in a grid of rectangles 40 columns wide by 25 rows high. Within each rectangle are eight bytes of data, each sitting on top of another like pancakes. For example, this is what the letter "A" would look like displayed in high-resolution graphics in the upper left-hand eight-dot by eight-dot rectangle on a high-resolution screen:

TABLE 2

Bit-Mapping a Character in High-Resolution Graphics

Screen Location	Screen-Map Location	Binary Notation	Appearance
Line 1	Byte 0	00000000	
Line 2	Byte 1	00011000	XX
Line 3	Byte 2	00111100	XXXX
Line 4	Byte 3	01100110	XX XX
Line 5	Byte 4	01100110	XX XX
Line 6	Byte 5	01111110	XXXXXX
Line 7	Byte 6	01100110	XX XX
Line 8	Byte 7	00000000	

If another "A" were to be printed in the second position of the first row on a high-resolution screen—that is, just to the right of the screen position illustrated in Table 2—the bit pattern in the third column of Table 2 (labeled "Binary Notation") would be repeated in Bytes 8 through 15 on the high-resolution screen map. The next rectangle on the first row of rectangles on the screen would be controlled by Bytes 16 through 23 on the high-resolution screen map—and so on, all the way down to the bottom right hand corner of the screen.

This zigzag layout makes it easy to mix text and graphics on a C-64 screen, since text and graphics are laid out on the screen in exactly the same way. But it also makes dot-plotting somewhat complicated. To plot a dot on a C-64 high-res screen, you first have to figure out where the dot lies on a 320-dot wide by 200-dot high screen, using straightforward column and row coordinates. Then, since the C-64 high-resolution screen is subdivided into 8-dot by 8-dot rectangles, you have to break the screen down into a 40-column, 25-row grid by dividing each coordinate by eight. This division operation takes place in Lines 90 and 100 of BLACKBOARD.BAS:

```
90 CHAR=INT(HPSN/8)
100 ROW=INT(VPSN/8)
```

The next step in plotting the position of a dot is to figure out just where in the appropriate 8-dot by 8-dot matrix the desired dot lies. This calculation is carried out in Lines 110 and 120 of BLACKBOARD.BAS:

```
110 LINE=VPSN AND 7
120 BYTE=BASE+ROW*320+CHAR*8+LINE
```

Finally, you have to turn on the bit you have selected with a line such as this:

```
140 POKE BYTE,PEEK(BYTE) OR (2^BIT)
```

The above formula takes a long time to calculate in BASIC, and that is why BLACKBOARD.BAS runs so slowly. Next month, you'll get a chance to see how much faster the program runs in assembly language.

INITIALIZING HIGH-RES GRAPHICS

Now that you know how the high-resolution screen map works, let's look at the first part of the BLACKBOARD program and see what has to be done to put the Commodore 64 into its high-resolution graphics mode. The first statement in Line 20—BASE=2*4096—defines a constant which will be used later in the program to point to the starting address of a high-resolution screen map. This screen map will start at Memory Address 8192, or $2000 in hexadecimal notation. In the second statement

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in Line 20—POKE 53272,PEEK(53272)OR8—the C-64's video interface chip (VIC) is told where to place its high- resolution screen map and where to find the data that it will need to display a high-resolution screen. The memory address used in this statement, 53272 (or $D018 in hex), is the address of a memory register referred to in C-64 documentation as VMCSB. When the C-64 is in its bit-mapped mode, the lower four bits of the VMCSB register are used to specify screen colors, and the upper four bits are used to point to the location of the bit map that will be used for a high-resolution display.

In Line 30, the VIC chip is instructed to go into high-resolution mode. This instruction is issued by setting Bit 4 of a memory register known in C-64 literature as SCROLY. One function of the SCROLY register is to implement fine scrolling—a capability we will not go into in this column. The BLACKBOARD program makes use of another capability of the SCROLY register: determining whether the C-64 will generate a text screen or a high-resolution display. If Bit 4 of the SCROLY register is set, the 64 will generate a high-resolution screen. If Bit 4 is clear, the computer will produce a text display.

In Line 50 of BLACKBOARD.BAS, Memory Addresses 1024 to 2023 ($0400 to $07E7 in hex notation) are stuffed with the value 16, which will cause a white line to be printed on a black background. When the C-64 is in its low-resolution graphics mode, the segment of memory from 1024 to 2023 is used to hold the Commodore ASCII codes that are used to print characters on the screen. But when the 64 is in its bit-mapped mode, this segment of RAM is used as an "overlay" that determines what background colors will be printed on the screen. In each byte of this block of RAM, the lower nibble is used to determine the color of any bits that are turned off in the corresponding rectangle on the screen, and the upper nibble to determine the color of any bits within the rectangle that are turned on. Since BLACKBOARD.BAS draws a white line on a black screen, the value 16—or $10 in hexadecimal notation—is stored in each byte of color RAM. Since 1 is the color code for white and 0 is the color code for black, storing the value $10 in each byte of color RAM will cause a white line to be drawn on a black screen.

Line 60 of the BLACKBOARD program is nothing but a jump back to Line 200. In Lines 200 through 240, a vertical line is drawn down the center of the screen using a bit-mapping subroutine that appears in Lines 80 through 250. This subroutine employs the plotting formula described earlier in this column to print white dots on a black background on the screen.

The line that is drawn down the screen in Lines 220 through 240 is two dots wide. That's because it takes a two-dot width to form a good solid line on a Commodore 64 screen; a line only one dot wide tends to show up pale and gray. The loop that draws this line appears in Lines 225 to 240.

After the vertical line is drawn, a horizontal line is mapped across the screen in Lines 245 through 280. Horizontal lines that are one dot high look fine in Commodore graphics, so this line is just one dot high.

The BLACKBOARD program ends with an infinite loop at Line 290.

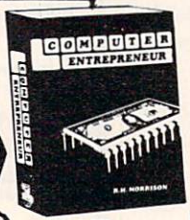
When you run the BLACKBOARD program, you'll see how your computer clears the bit map that extends from BASE to BASE+7999, then changes the background color of the screen to black. Then, ever so slowly, you'll see your computer draw a set of crosshairs on your screen. Next month, you'll get a chance to see how much faster the BLACKBOARD program would execute if it were written in assembly language. Then you'll get an opportunity to type, assemble, and execute a program that will enable you to draw pictures with a joystick on a high-resolution screen! ☐

SEE PROGRAM LISTINGS ON PAGE 124

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CADET'S COLUMN

BASIC Programming for Beginning Commodore Computerists

Including *Compuloan,* a Loan Payment Calculator for the C-64

BY CHERYL PETERSON

This month I'm going to focus on BASIC. But even though this is a beginner's column, I am not going to degenerate into the standard explanations of PRINT, GOTO, GOSUB, OR, IF/THEN, and WHO CARES. There are many good books on BASIC programming, so who wants me to waste space saying it all again? If that isn't enough, Dale Rupert's column does a great job of teaching programming. Instead, let's take a look at some BASIC programming tricks and aids that will speed things up. I'll even throw in a program that I wrote. It's not fancy, but it works. Anyway, more on that later.

One great way to expedite BASIC programming is to cheat and use someone else's routines. Although it is illegal to steal programs that are copyrighted, many good programs are available in the public domain. (No, all those advertisements for "almost free" software are not rip-offs.) In fact, public domain software is a good source to build on. I intend to devote a whole column to public domain software later, but for now I'll just say that these programs are a good source of inspiration. They can also help you do very useful things.

One such program goes by the name *TX2BAS.* It takes a sequential (SEQ) file (like those created by many text editors) and converts it into a tokenized BASIC program file. Why would you want to do that? Although the Commodore screen-oriented BASIC editor is a vast improvement over the editors offered with other computers' versions of BASIC, it is still limited to the lines you can list on the screen. You don't have complete freedom of movement from top to bottom. With long programs, this can be a pain. Block moves, copies and deletes, along with global find and replace options, can really make programming flow faster. BASIC's editor just doesn't have them.

Text editors, on the other hand, offer such features, but the Commodore won't read "text" files as BASIC programs. *TX2BAS* solves the incompatibility problem.

Electronic bulletin board systems, accessed through modems, frequently contain public domain BASIC programs that need only slight modifications to run on the Commodore. Unfortunately, these programs are usually stored as ASCII text files and although most terminal packages (modem software) will translate ASCII into PET ASCII, they won't translate SEQ files into tokenized BASIC files. Once again, *TX2BAS* solves the problem. There are several versions of it, the latest being *TX2BA4.*

Where can you get this wonder program? In addition to its presence on the following page, it can be found on CompuServe in the Commodore Beginners Special Interest Group (GO CBM 963) in Data Library 2. Type BRO TX2BA4.SEQ at the DL2: prompt, if you are using a terminal program that doesn't support CIS protocol. Once the file is found for you, choose the R prompt to READ the file into your buffer. You'll need to save the program to disk or tape to use it. If you are using Vidtex or some other package that can download .IMG files, type BRO TX2BA4.IMG. When the file has been located, use the D command to DOWNLOAD the file. Your terminal program should automatically save the file for you.

A document file, *TX2BAS.DOC,* explains how to use the program. I'd recommend downloading this file, because it has a useful description of how to use *TX2BAS* to merge programs together—a very handy feature if you have a library of routines that you like to use regularly. You can append the routines at the end of your program instead of typing them in repeatedly.

For those who don't have CompuServe protocol compatible downloads, you'll have to use the BASIC editor to type *TX2BAS.* Once you have it in runable form, you need only follow the prompts to convert your files from SEQ to PRG. It only requires the name of the file to convert.

I must warn that my version is slightly different from the CIS program. The doc file mentions that once you've downloaded theirs, you must edit it slightly. In the original version, two lines that were included as remarks actually controlled whether *TX2BAS* sought the SEQ file

TX2BAS

Letters on white background are *Bug Repellent* line codes. Do not enter them! See page 122 for instructions.

```
·62990 A=PEEK(61)+256*PEEK(62)+3:POKE786,
 INT(A/256):POKE785,A-256*PEEK(786)          CC
·62995 IFERTHENPOKEA-2,0:POKEA-1,0:POKE45
 ,PEEK(785):POKE46,PEEK(786):CLR:END         GN
·63000 POKE53280,0:POKE53281,0:POKE646,1     AG
·63009 PRINTCHR$(147)                        FG
·63010 PRINT "THIS PROGRAM WILL TURN TEXT
 BASIC FILES INTO RUN BASIC PROGRAMS";       GC
·63020 PRINT "USING THE COMMODORE DATASET
 TE OR DISK DRIVE."                          CF
·63030 PRINTCHR$(17)"THE PROGRAM WILL DEL
 ETE ANY LINE"                               JN
·63040 PRINT"OF THE FILE IN CASE IT IS NO
 T A PROGRAM LINE."CHR$(147)                 ED
·63043 INPUT"NAME OF FILE TO BE CONVERTED
 ";F$                                        DJ
·63045 PRINT "[4" "]"CHR$(18)"T"CHR$(146)
 "APE OR "CHR$(18)"D"CHR$(146)"ISK?"         MI
·63046 GETA$:IFA$=""THEN63046                PP
·63047 IFA$="T"THEND=1:SA=0:N=1:GOTO63080    EG
·63048 IFA$<>"D"THEN63046                    KO
·63050 D=8:SA=3:N=3                          FF
·63080 PRINT "HIT A KEY WHEN READY!"         CI
·63085 GETA$:IF A$=""THEN63085               PI
·63090 PRINTCHR$(147)                        FG
·63097 OPEN3,D,SA,F$:PRINT"READING FILE,
 PLEASE BE PATIENT!":FORX=1TO1000:NEXT       AM
·63099 POKE152,3:T$=""                       EJ
·63100 GET#3,A$:IF A$=""THEN63100            KC
·63105 IF ST=64THEN63250                     AG
·63106 IF A$=CHR$(13)THEN63130               KF
·63110 T$=T$+A$                              MK
·63115 A$="":GOTO63100                       EF
·63130 IFLEN(T$)<3THENT$="":GOTO63100        LN
·63140 IFLEFT$(T$,1)=CHR$(10)THEN63250       BM
·63142 IFVAL(LEFT$(T$,1))=0THENPRINTT$:T$
 =RIGHT$(T$,(LEN(T$)-1)):GOTO63140           OO
·63220 PRINTCHR$(147)"[6" "]TRANSLATING T
 EXT INTO BASIC[3"."]"                       HG
·63225 PRINTCHR$(17)CHR$(17);T$:PRINT"GOT
 O 63099"                                    LL
·63235 POKE198,2:POKE631,13:POKE632,13:PR
 INTCHR$(19):END                             EA
·63240 IFVAL(LEFT$(T$,1))=0THENT$=RIGHT$(
 T$,(LEN(T$)-1)):GOTO63140                   KB
·63250 PRINTCHR$(147)"CONVERSION COMPLETE
 [3"!"]":CLOSE3:PRINT                        EE
·63260 PRINT"DO YOU WANT THIS CONVERTER"     NP
·63262 PRINT "DELETED BEFORE YOU SAVE THE
 NEW PROGRAM?"                               HG
·63265 GETA$:IFA$=""THEN63265                PM
·63266 IFA$="Y"THENER=1:GOTO62990            EI
·63270 PRINT"ALL DONE! CHECK IT OUT!"        MP
·63280 END                                   IC
```

on tape or disk. *TX2BAS* required removing the REM at the beginning of the line you wanted to use. My version asks whether the SEQ file is on tape or disk. It adds an extra keystroke, but gives more flexibility.

CompuServe's latest version, *TX2BA4* looks for the SEQ file on the device from which it was loaded. Both my version and *TX2BA4* required only a few lines of changes to make them easier to use.

This is just the type of thing you should think about doing: taking an already written program and modifying it to make it do what you want. Why duplicate someone else's work if they choose to give it away?

FIGURING LOAN PAYMENTS

Although there are several programs available that will compute the payments for a loan, I decided to write my own. I used a formula for calculating loan payments from a general BASIC manual. I wrote the necessary GET statements and prompts to put the numbers in the formula, tried out several routines for rounding numbers down to two decimal places, wrote some print formatting routines, and added a couple of error trapping lines just to keep things from getting messy. Sounds easy, doesn't it? It took two days!

Even when you have a pretty good idea of what you want to do, problems crop up that you don't expect. If you're like me, you do a minimum amount of planning and jump right in with both feet. As you can see from the line numbers in my program listing, things weren't always as simple as I thought they'd be. And then when I really got moving I thought of a couple of neat additions to make the program nicer.

Earlier, I mentioned borrowing routines. Well, I went through three different ones to round numbers to the second decimal place. I finally settled on a one-liner, but at one time the routine at 2000 had eight lines containing two separate routines. As it turned out, the two of them just refused to work together. I wasted about five hours before I finally got through that section.

You see, programming is an inexact science. Actually, it's more of an art. Programming languages come in various shades, with peculiarities bound to each. And even within the same language, there may be many ways to accomplish the same end. BASIC is a flexible medium. As in painting, there is no "correct" technique.

Programs that you write for your own use do not have to be perfect! If they work for you, that's what counts. But there is always someone out there who just can't resist trying to fix a program up a bit. And that is what the public domain is all about. By putting your program out there, where people can see it, someone may just perfect it for you. The changes in *TX2BAS* are a "perfect" example.

Of course, you'll have to suffer the slings and arrows of those who think every program must be a work of art. Proponents of "structured programming" may well use your handiwork as an example of how *not* to write programs. And the ten year old down the block may laugh hysterically when he finds out the program wasn't writ-

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ten by a nine year old. But, every time you get a program to do what you want it to, you're learning or creating a new technique that works for you. And eventually, you'll feel comfortable saying, "Yeah, I do a little programming now and then. Why? What are you working on? Maybe I can help."

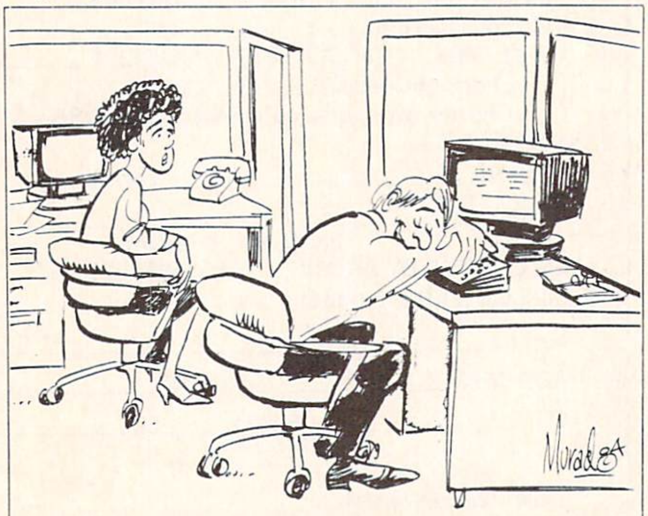
By the way, I know there are loan programs in the public domain, but since I'm writing about programming I thought the least I could do was put something original in my column.

For the education of those who care, I'll try to explain what the program does and how it does it. For those of you who couldn't care less about programming, skip to the "Future Columns" header. Unless you need this program to figure out how much new car you can afford to buy and still make the payments! Or maybe you're looking for a new house?

Are you sure you're going to want that $76,000 beauty when you find out that you'll pay $177,609.97? That's $101,609.97 in interest at 13.5% over 15 years, $986.72 every month. The monthly payment comes down, but the interest doubles, if you extend the payments over 30 years.

My program takes the amount you plan to finance, the number of payments per year, the total number of payments, and the interest rate, and spits out the size of individual payments, the total amount you'll be paying back, and how much of that is interest. It will also print out a payment schedule showing the balance owed, the payment made, how much of that payment is interest, and how much applies toward the principal. This can be a long list when you're thinking about a 30-year mortgage.

As mentioned before, I don't use a very structured style. The opening lines identify the program. Then, a couple of GET statements are used to determine whether the screen or printer is used for output and whether the payback schedule is generated or not. (More on these later.) INPUT statements are then used to get the numbers to feed into the equations. The GOSUB to 1000 is an error trap to prevent using negative numbers. By taking the



"I programmed it to wake me up if the boss comes in."

absolute value, the negative is stripped off.

Lines 250 and 251 check to see if you want a printout and open a channel to the printer, if appropriate. Line 260 clears the monitor screen. I chose to have the PRINT statements reprise the information that has been entered, so that the upper section gives all the details; amount financed, interest rate, payments per year, and how many payments total.

By doing it this way, it's convenient to refer to them later. (Like when you're trying to convince your husband that you really can afford that new washing machine. You'll have to write your own program to show how the thing will pay for itself by saving on the laundry bill.) The printouts are also helpful when doing comparison shopping. One dealer may give you a better price, another a lower interest rate, and a third a longer term loan. Comparing the printouts may help you see which is the best deal and which deal you can afford.

Line 275 sends the amount financed figure off to be rounded by the routine at 2000, via line 4030. I had two other rounding routines, one a three liner, another six lines long. I chose this one because it's short, sweet, and it works. Lines 400 and 410 actually compute the individual payments and amount of interest paid over the life of the loan.

The subroutines at 3000 and 4000 take the active variables and reassign them to the variable B to be rounded by GOSUB 2000. When the result of the truncation comes back, it has to be reassigned to its old variable for printout.

Lines 600-640 give the results of the calculations. Line 690 checks to find out whether you want a loan schedule printed or not. If not, it sends execution to the END statement.

Lines 691, 695, and 697 calculate the values for the first line of the loan schedule. Lines 700 and 760 control the output format. Since the screen is only 40 characters wide and most printers are 80 characters wide, I set the program to print out in two different ways. Although the screen format would work with the printer, I wanted to take advantage of the printer's wider line length. (Add an extra three hours of programming time to get the printout right!)

The X variable is used to keep track of how many lines have been printed. The X2 variable tracks what page is printing. The first page has 50 lines of loan schedule, as the first 10 lines are used to print the loan information. The other pages have 60 lines. Lines 730 and 740 use the X variables to track the lines and pages that have been printed. CHR$(127) is a form feed. When the printer receives one, it will page over the perforations between sheets of paper. (This assumes you're using a tractor feed printer.)

For those who use a printer that takes cut sheet paper and want a challenge, try writing in a couple of routines to pause at the end of pages. You'll need to use a routine that takes keyboard input to restart the printout.

Lines 750-753 are used to get the numbers lined up on the decimal point. Again, this is a borrowed routine someone else submitted to a magazine for others to use.

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Next is a perfect example of sloppy programming. (One of those where a picky person would start getting critical and recommend a course in structured programming.) Line 770 duplicates the calculations performed by lines 691, 695, and 697. A structured programmer would have stuck them in a subroutine at the end. But I didn't realize I would need them more than once until I started working out the page formatting. And I was too lazy to rewrite eight lines of code. (Doesn't that make you feel better? Just to know that someone else is lazy, too?)

820 tidies up the loose ends at the bottom of the printout. (After all, the one payment at the end usually turns out to be less than the rest.) 825 checks to see if the schedule is complete. If so, it ends the program. Otherwise, the program loops back to print the next line of the table.

That's it, folks. It isn't pretty. It isn't fancy. It just works!

There is usually a hidden point to my meanderings. The obvious purpose of this exercise was to show a little bit about BASIC programming. But the covert messages are that anyone can program, you don't have to be a perfectionist, and you learn by doing.

Many programs you see in magazines look so clean and neat and tidy because they've been done by someone who has been programming for quite a while. (Or they've been edited by someone equally adept.) But programs don't have to be pretty to be functional. And when you first start programming, the results aren't likely to be pretty. (Actually, they probably won't be functional either!) With practice, though, the pieces start to fall into place.

Once you've decided to jump into programming, there are a few aids that can make it go faster. *Ahoy!* has already published a program that generates line numbers for you and another that renumbers them. Though there are extended versions of BASIC available, beginners should probably stick with the basic BASIC until they've gotten a bit more experience.

Two commercial programs will help speed things up for you: *XREF 64* and *BASIC 64* from Abacus Software.

X-REF 64 is an inexpensive little program that analyzes your program and prints a list of all keywords, functions, and variables used. It gives a nicely formatted, paginated listing of all the numerical values, variables, and BASIC keywords, as well as the lines in which they appear.

When programming in BASIC, it is often difficult to remember just where everything is in a program. If the program doesn't have comments identifying sections where specific processes take place, it is especially tough. Most programmers use variable names that correspond to the functions or ideas represented by the variables. While this helps make deciphering printouts easier, trying to find a given variable in an 800-line program is like trying to find a dime in a pile of nickels. When you have a listing of all the variables and the lines in which each appears, it's easier.

Complaints that BASIC programs run slowly are well founded, and when you can buy an inexpensive compiler that will improve the speed at which your programs run, it's a shame not to have one. *BASIC 64* is such a program. Depending on how often you use a program you've found or written, it may or may not be worth compiling. A long program can take up to 30 minutes to compile, but once compiled it will run much faster. The compiler won't speed up output to the screen or to a printer or modem. It will speed up internal calculations and processing that the computer does.

Castle, one of my favorite public domain games, takes a couple of minutes to assign variables and manipulate data when the game starts. Of course, it displays a short text explanation of the game while it is doing all this, but the wait is annoying. Enter *BASIC 64*. It took about 20 minutes to compile *Castle* and now the initialization wait is only about 15 seconds. Although there is a noticeable improvement in the opening segment, the screen display is still slow since BASIC doesn't use direct screen addressing.

I should mention that *Castle* was originally written for a TRS-80 computer running MicroSoft BASIC. I originally downloaded it from a public BBS with my Osborne 1 computer (the machine I used before I got my Commodore). It required only small modifications to run. I later used the Commodore RS232 module and a null-modem (direct connect) cable to transmit *Castle* to the Commodore as an ASCII file. After using *TX2BAS* to convert it to a PRG file, I was able to modify it to run on the Commodore. Although all three machines run MicroSoft BASIC, each version is slightly different (just as BASIC 7.0 for the 128 is different from the 4.0 than runs on the 64).

WHO WILL BENEFIT FROM *BASIC 64*?

For those who find BASIC programs that they use consistently, *BASIC 64* would be a great asset. It's surprisingly easy to use. The documentation is concise; simple explanations for the simple features. Although the program has advanced features that more experienced programmers will find useful, it is designed to be usable by programmers of any experience level. Using the advanced features, assembly language routines can be included and modules can be strung together.

The resulting compiled programs usually take up just as much (if not more) disk space, but the speed makes up for it. While other compilers cost close to $100, *BASIC 64* costs $39.95. And as you get more heavily into programming, it expands to suit you.

BASIC 64 is available for $39.95 and *X-REF* for $17.95 from Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510 (phone: 616-241-5510).

FUTURE COLUMNS

If any of you have a particular topic you'd like to hear more about, please write me in care of *Ahoy!* All your letters will be forwarded to me, here in Miami. For any of you who'd like to contact me via CompuServe, my user number is 72366,2645. Since I'm only an occasional visitor to the CBM SIG's, EasyPlex is the best way to get in touch. ☐

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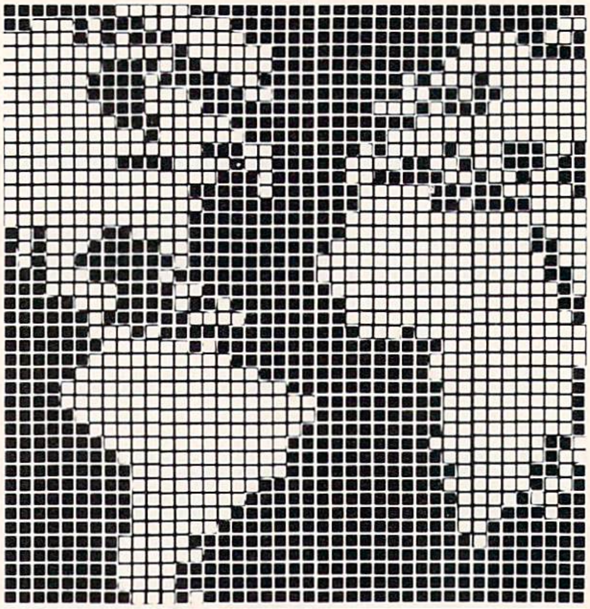


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By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *Name* and *Number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #23-1: EDGE WEDGE

This problem was submitted by Charles Grady (Cleveland, TN). The user inputs a string. The computer prints the string as a wedge against the right side of the screen. An example gives the details: if the input is "A TEST", the output is

```
     T
    ST
   EST
  TEST
  TEST
A TEST
```

One restriction—no cursor arrow keys are allowed. The output should be displayable on the screen or on a printer.

PROBLEM #23-2: ROOTING ROUTINE

Allan Flippin (San Jose, CA) suggested this problem for the mathematically inclined. The user inputs a number between 1 and 65535. The computer displays the square root of the number to the nearest whole number. Of course there's a catch. The routine must be in BASIC and must use only +,−,/,*, and relational operators (no BASIC functions such as SQR or LOG). Dig out those algorithm books.

PROBLEM #23-3: SPEEDY BUG

This classic problem suggested by James Borden (Carlisle, PA) should make a good *Commodare.* Two trains head toward each other on the same track. Train A goes 62.5 mi/hr and Train B goes 37.5 mi/hr. The trains are 800 miles apart when a fast bug leaves Train A, flies to Train B, immediately turns around and flies back to Train A, whereupon it instantly turns and returns to Train B, et cetera ad infinitum, or at least until the trains meet, smashing the bug between them. (Please substitute a less violent scenario if you prefer.) How far does the bug fly?

Already some of you are writing down the answer and preparing to send it to us, but wait. What we want here is a computer simulation, not just the right answer. Pretend that the answer is not easy to calculate (of course it is if you know how), and let the computer figure it out. (Any graphically animated solutions should be sent on tape or disk.)

PROBLEM #23-4: TYPING TUTOR

The computer displays a sentence. The user types the sentence. The computer then displays the number of errors the user made and the amount of time in jiffies it took to type the sentence. Nothing too difficult or tricky here. Let's see some solutions from you first-time programmers.

This month we will look at readers' solutions to *Commodares* from the July issue of *Ahoy!* There are a few other items of business to handle as well. First a special word of thanks to the readers from other countries who sent solutions and letters to *Commodares.* In addition to the Canadian readers mentioned later, we have received "international solutions" to various problems from Yilmaz Atila (Izmir, Turkey), Christian Leyer (Quakenbrueck, Federal Republic of Germany), and Ricardo Chan (Panama City, Panama). Readers in other countries should feel free to write, whether you have solutions to *Commodares* or not. It is a pleasure to hear from all of you.

Tony Ruperto (Kitimat, BC, Canada) succinctly answered the question posed in a previous *Commodares* column as to when a space is mandatory in a BASIC program. He states that the only time a space is needed is when the combination of two words or letters make up a third which is a reserved word or another BASIC keyword. For example, A=TAND128 requires a space between the T and the AND or else the computer will

assume that the tangent function is desired and give a syntax error. Bugs like that can be quite puzzling at first.

Joseph Taylor (Jenison, MI) was the first to send the translation of the cryptogram listed at the end of the August *Commodares*. Joseph solved it without help of a computer in 45 seconds. It was a one-letter displacement code where "ABC..." were replaced by "BCD...". I would still like to hear from someone who has a program to help arrive at the result based on standard letter frequencies. This is a difficult problem with such a small sample of encoded text, but it might be fun to try.

In response to the challenge for a significant-digit rounding function, Michael Skloff (New York, NY) sent the following:

```
DEF FNL(N)=INT(LOG(ABS(N))/LOG(10))
DEF FNS(X)=INT(N*10^(X-FNL(N)-1)+.5)*10^
(FNL(N)-X+1)
```

These functions properly round the number N to X significant digits. The first function calculates the base−10 logarithm of N. This is used to gauge the size of N. The second function performs the actual rounding. The 80-character line limit is the only reason for having two functions. The variable N must store the number to be rounded. Then PRINT FNS(3) will display the value of N rounded to 3 significant figures. (Unfortunately 1.235E+15 rounded to 3 significant figures resulted in 1.23E+15 instead of 1.24E+15, but perhaps that is because of the internal storage of the values. Can any readers provide further insight into this problem?) Thanks to Michael for these functions.

Thanks also to Scott Duncan (Superior, NE) and John R. Prager (Bay City, MI) for detailed analyses of the "N elements printed in C columns" problem presented in *Commodares #19-1* in the July issue. John Prager summarizes the situation as follows: assume that R is the remainder when N is divided by C. If R is greater than zero but less than C−1, it is not possible to display N numbers in C columns as described in the problem. If anyone is interested in the proofs, send a self-addressed stamped envelope to *Commodares* at the above address.

One final tidbit before looking at July's problems. Charles Grady (Cleveland, TN) sent the following program in response to the cycling function challenge *(Problem #18-1):*

```
10 FOR I=0 TO 100 STEP 5:GOTO 30
20 FOR L=95 TO 5 STEP -5:GOTO 40
30 PRINT I:NEXT I:GOTO 20
40 PRINT L:NEXT L:GOTO 10
```

First let me say that the program works as advertised on the Commodore 64. The reason I have listed the program is that before I entered it into the computer and ran it, I would have sworn that it wouldn't work. Do you know why? (Study it for a moment if you are a long-time BASIC programmer.)

Back in the old days, rule number one regarding nested FOR-NEXT loops was that they must not overlap. It is okay for one loop to be contained completely within another, but the inner loop must not meander outside of the outer loop as in this example. Well, so much for the old days. The C-64 handles this program without any trouble. Out of curiosity, I tried the program on an IBM PC. It gave a "NEXT without FOR in line 40" error before it reached line 20. If any of you have other computers to try this on, let me know your results. How about the C-64 BASIC Compiler? What happens if you use the NEXT statements without variables? Thanks to Charles for an interesting problem.

Now on to July's *Commodares. Problem #19-1: Binary Palindrome* brought dozens of responses. There were several significantly different categories of solutions. For a binary number to be a palindrome, it must be a sum of one or more of the following values: 129, 66, 36, and 24. This is easily seen by writing the binary values for those numbers. Each number contains two symmetrically placed ones. The solution from Mark Tillotson (Tulsa, OK) typifies the approach that looks for such terms within a given number.

```
1 REM
2 REM PROBLEM #19-1:
3 REM     BINARY PALINDROME
4 REM BY MARK TILLOTSON
5 REM
10 INPUT"VALUE";N:IF N<0 OR N>255THEN10
20 IF N>=129 THEN N=N-129
30 IF N>=66 THEN N=N-66
40 IF N>=36 THEN N=N-36
50 IF N>=24 THEN N=N-24
60 IF N=0 THEN PRINT"YES":PRINT:GOTO 10
70 PRINT"NO":PRINT:GOTO 10
```

Mark's trial subtraction essentially "crosses out" symmetrical pairs of ones in the binary representation of the given number. If anything is left over, line 70 concludes that the number does not have a binary palindrome.

Another approach to this problem is to perform bit-by-bit analysis on the given number. If the number is a palindrome, the seventh bit must match the zeroth bit, bits six and one must match, and so forth. Most solutions using this approach contained statements such as

```
IF (N AND 64)/64 <> (N AND 2)/2 THEN (NO
 PALINDROME)
```

or

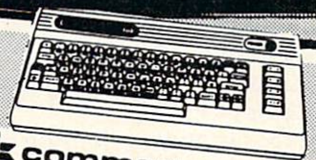
```
IF (N AND 64)=64 AND (N AND 2)=2 THEN (P
OSSIBLE PALINDROME)
```

The most impressive program of this type is the following from Patti Beadles (Hazelwood, MO):

```
1 REM
2 REM PROBLEM #19-1:
3 REM     BINARY PALINDROME
4 REM BY PATTI BEADLES
5 REM
10 INPUT"NUMBER TO BE CHECKED";N
```

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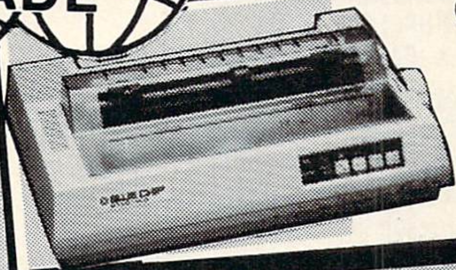
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```
20 IF N<0 OR N>255 THEN END
30 IF SGN(N AND 128) <> SGN(N AND 1) THE
N 80
40 IF SGN(NAND64)<>SGN(NAND2) THEN 80
50 IF SGN(NAND32)<>SGN(NAND4) THEN 80
60 IF SGN(NAND16)<>SGN(NAND8) THEN 80
70 PRINT"PALINDROME":GOTO 10
80 PRINT"NOT A PALINDROME":GOTO 10
```

Notice Patti's use of the oft-forgotten SGN function. The result of each AND operation will be either zero or positive. Both AND operations on each line must agree if the number is a palindrome. The SGN function returns the value one if the result is positive and zero if it is zero. No more information is needed to determine the palindromicity (to coin a word) of the number.

Jim Speers (Niles, MI) took the problem a step further to find all 16-bit binary palindromes. Problems occur when dealing with negative numbers. Readers up for an additional challenge might give it a try.

The solution to *Problem #19-2: Memory Locator* from John R. Prager (Bay City, MI) is listed below.

```
1 REM
2 REM PROBLEM #19-2:
3 REM    MEMORY LOCATOR
4 REM BY JOHN R. PRAGER
5 REM
50 A$(8)="HELLO" + " THERE!" :REM DEMO
60 REM
100 DEF FNM(X)=PEEK(X)+PEEK(X+1)*256
110 PRINT"PROGRAM TEXT:" FNM(43) "TO" FN
M(45)-1
120 PRINT"VARIABLES:" FNM(45) "TO" FNM(4
7)-1
130 PRINT"ARRAYS:" FNM(47) "TO" FNM(49)
140 PRINT"STRING STORAGE:" FNM(51) "TO"
FNM(55)
```

Line 50 of John's program demonstrates that the string concatenation causes the computer to use a temporary storage area for the string values. If the "+" and the second string literal were not on line 50, a separate string storage area would not be used.

James Borden (Carlisle, PA) wrote his solution to this problem as a subroutine. You might do the same to see how the storage areas change as your program is executed.

I suggest that you add some FOR-NEXT loops to PEEK into the storage areas to see how the various variables are stored. You might also refer back to the April, May, and December 1984 editions of the *Rupert Report* for some further clues about the inner workings of BASIC. Why is so much variable space used in John's program when there aren't any non-array variables?

Of the numerous solutions to *Problem #19-3: Orthogonal Time,* William Lott's (Coventry, CT) was the easiest to understand.

```
1 REM
2 REM PROBLEM #19-3:
3 REM    ORTHOGONAL TIME
4 REM BY WILLIAM LOTT
5 REM
10 PRINT"+" : X=5400 : GOSUB 1000
20 X=X+10800 : GOSUB 1000 : GOTO 20
1000 S=X/5.5:Y=INT(S):Z=S-Y:IF Z>.5 THEN
 Y=Y+1
1010 IF Y>43200 THEN END
1020 H=INT(Y/3600):M=INT((Y-H*3600)/60):
SEC=Y-H*3600-M*60
1030 PRINT"HOUR="H,"MIN="M,"SEC="SEC:RET
URN
```

In order to find the times at which the hands of the clock form right angles, William uses the fact that the minute hand gains 5.5 (angular) minutes on the hour hand every second. This follows from the fact that the hour hand moves half an (angular) minute every second, and the minute hand moves six (angular) minutes every second.

The program starts at 12 o'clock (0 degrees between the hands) and determines the time at which the minute hand has gained 5400 (angular) minutes (90 degrees) on the hour hand. Every other occurrence of a 90 degree angle is 180 degrees (10800 angular minutes) after the previous occurrence. The subroutine at line 1000 converts angular minutes into hours, minutes, and seconds.

Those of you familiar with the concepts of relativity will recognize that this program uses the hour hand of the clock as a reference frame. The calculations are much simpler if the face of the clock is used as the frame of reference.

A program using a similar approach but written in COMAL by Ray Carter (Las Cruces, MN) is listed here for comparison.

```
1 REM
2 REM COMMODARES #23
3 REM PROBLEM #19-3 : ORTHOGONAL TIME
4 REM COMAL SOLUTION BY RAY CARTER
5 REM
6 REM    (LINE NUMBERS AND LEADING
           COLONS ARE NOT USED)
7 REM ---THIS IS NOT A BASIC PROGRAM---
8 REM
10 :MINUTE'RATE:=.1
11 :HOUR'RATE:=1/120
12 :DELTA:=MINUTE'RATE - HOUR'RATE
13 :ANGLE:=90
14 :REPEAT
15 :    TIMEOUT:=ANGLE/DELTA
16 :    IF  (TIMEOUT<43200)
          THEN PRINTOUT(TIMEOUT)
17 :    ANGLE:=ANGLE+180
18 :UNTIL  TIMEOUT>43200
19 :STOP "THAT'S ALL FOLKS"
20 :PROC  PRINTOUT(TIMEOUT)  CLOSED
21 :    TTIME:=TIMEOUT
22 :    HOURS:=TTIME  DIV  3600
23 :    TTIME:=TTIME  MOD  3600
24 :    MINUTES:=TTIME  DIV  60
25 :    TTIME:=TTIME  MOD  60
```



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```
26 :    SECONDS:=INT(TTIME+.5)
27 :    PRINT USING "##:##:##":HOURS,
        MINUTES,SECONDS
28 :ENDPROC  PRINTOUT
```

The program structures and functions available in this language can make most of us "bare-bones BASIC" programmers somewhat envious. The program flow should be fairly obvious even to programmers that have not used COMAL. The rates defined in this program are in angular minutes per second. The minutes on the clock face are six angular minutes apart, and the minute hand travels six angular minutes in six seconds or 0.1 angular minute per second. (1 angular degree = 60 angular minutes.)

The final problem this month left a few readers somewhat frustrated. *Problem #19-4: Screen Scramble* did not prescribe how to handle the fact that a 40 by 25 screen cannot simply be rotated into a 25 by 40 area. Such details were left to the programmer's creativity. Both solutions listed below chopped off the screen at the 25th column and gave it a 90 degree clockwise rotation. There is one significant difference between the ways they did it, though.

The solution from Allan Flippin (San Jose, CA) actually rotates each character 90 degrees. After you run his program, you may stand your monitor on its side and see the original screen appearance!

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```
1 REM
2 REM COMMODARES #23
3 REM PROBLEM # 19-4 : SCREEN SCRAMBLE
4 REM SOLUTION BY ALLAN FLIPPIN
5 REM
400 X=4:PRINT"+"
402 FOR Y=0 TO 11:FOR X=0 TO 24:POKE 102
4+40*Y+X,(25*Y+X)AND255
403 POKE55296+40*Y+X,11:NEXT:PRINT:NEXT
404 FORY=13TO20:FORX=0TO24:POKE1024+40*Y
+X,160:POKE 55296+40*Y+X,XAND15
406 NEXT:PRINT:NEXT:PRINT:PRINT"PRESS AN
Y KEY WHEN READY":I=49152
407 GET A$:IF A$="" GOTO 407
408 READ A:IF A<>-1 THEN POKE I,A:I=I+1:
GOTO 408
410 POKE 780,238:POKE 781,4:POKE 49187,9
2:SYS(49183)
411 POKE 53272,120:POKE 53265,59:POKE 56
576,150
412 FOR Y=0 TO 24:FOR X=0 TO 24
414 POKE 23584+40*X-Y,16*(PEEK(55296+40*
Y+X)AND15)+6:NEXT:NEXT
416 POKE 780,0:POKE 781,32:POKE 49187,96
:SYS(49183)
418 POKE 56334,0:POKE 1,51
420 FOR Y=0 TO 24:FOR X=0 TO 24
422 C=PEEK(1024+40*Y+X)
424 POKE 49160,208+INT(C/32):POKE 49159,
(C*8)AND255
426 S=24832+320*X-8*Y:POKE 252,INT(S/256
):POKE 251,S-256*PEEK(252)
428 SYS(49152):NEXT:NEXT
430 POKE 1,55:POKE 56334,1
434 GET A$:IF A$="" GOTO 434
436 SYS(65126)
438 DATA 169,1,133,253,162,0,189,0,0,160
,7,74,144,8,72,177,251,5,253,145,251
440 DATA 104,136,16,242,6,253,232,144,23
2,96,160,0,153,0,0,200,208,250,238
442 DATA 35,192,202,208,244,96,-1
```

A discussion of Allan's program is too lengthy for this column. If you want a copy of his source listing and remarks, send a self-addressed stamped envelope to *Commodares* with your request and I will send it to you. Basically Allan takes each character's bit map from ROM, rotates it, and puts it onto the screen at the new location. Anyone interested in having some serious programming done might do well to check with Allan.

The program from Bob Martin (West Lafayette, IN) involves some fancy work as well. The screen characters are printed from top to bottom starting at the upper right corner of the screen.

```
1 REM
2 REM COMMODARES #23
3 REM PROBLEM # 19-4 : SCREEN SCRAMBLE
```

Continued on page 146

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ERRATA

FASTNEW

An earlier version of *Fastnew*, which *does* bang the R/W head against the stop, accidentally saw print. In order to upgrade the published version of the program to the no-bang version, follow these steps:

Load in *Fastnew* as published. Replace lines 12 and 50 with the following:

```
12 REM        V0316/85
50 FOR I=0 TO 509:READ A:POKE I+9472,A
```

In line 1007, change the string V010585 to V031685. Replace the following lines as listed below.

```
5010 DATA 28,165,34,133,74,198,74,32
5020 DATA 212,6,198,74,208,249,162,0,32,
219
5040 DATA 36,240,12,32,72,5,48,7
5050 DATA 230,34,32,202,6,240,238,173
5270 DATA 141,3,28,32,245,6,169,0
5440 DATA 133,77,32,178,6,162,10,80
5470 DATA 105,10,133,48,76,134,6,169
5480 DATA 244,133,75,96,32,178,6,160
5570 DATA 32,205,6,174,0,28,232,76
5580 DATA 219,6,32,215,6,174,0,28
5630 DATA 160,32,208,240
```

Also lines 60000, 60001, 62000-62004 can all be deleted. They were useful during development of the program but are no longer needed.

AHOY! DOCK

Lines 1070, 1110 and 9520 each contained a GOSUB that had misprinted and was spelled GOSUSB. Ignore the extra S. Line 9550 was also misprinted. That line should read:

```
9550 F=.:FORJ=1TOC-1
```

START & END FILE ADDRESS

Due to an error in our listing generator program, line 10 is incorrect. It should read:

```
10 Q=24:P=Q*256:S=INT(P/256)
```

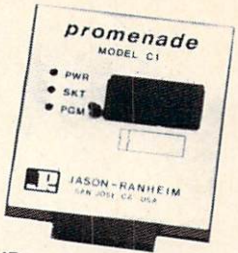
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Lines 6 and 7 contain a [008] within quotes. It should be replaced in each line by CNTRL H inside the quote marks.

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As the game begins, you are asked to enter the difficulty of the mission. The skill level ranges from one to six, one being the easiest, six being the hardest. The height of the building and the amount of time before the heat-seeking missile is fired depend on the skill level you select. Also, your maneuverability varies with the difficulty of your mission.

To maneuver your chopper, use a joystick plugged into control port 2. To control your rate of descent, hold down the fire button on your controller. After a short period of holding down the button, your helicopter will begin to hover. At this point you can maneuver your craft between the ledges to rescue the hostages. Releasing the fire button will cause the chopper to begin descending again. Movement in all eight directions is possible. However, do not try to move your chopper off the top or bottom of the screen; once a section of the building has scrolled off the top of the screen, it is gone and you cannot go back to it. Likewise, the only way to descend to the lower parts of the building is to allow your chopper to drop by releasing the fire button.

On every fourth floor of one of the buildings, you will see a hostage standing on a ledge. To save him, slow your chopper's downward fall to a hover and maneuver your chopper between the ledges. As soon as you touch the hostage, he is replaced by a heart symbol to show that he is safely on board. If you allow a hostage to scroll off the top of the screen, he is beyond help and you cannot save him.

If you are able to reach the bottom without crashing into the building, being hit by a shell, or running out of time, you will receive one hundred points for every man you have rescued. Also, extra points are awarded for the difficulty of your mission and for completing it in the least amount of time. ☐

SEE PROGRAM LISTING ON PAGE 136

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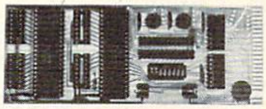
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FLOTSAM

Cheryl Peterson's guest editorial in the August Ahoy!, *concerning software piracy and its effect on the home computer industry, has drawn a wave of responses from both sides of the gangplank. A sampling is presented in this month's edition of* Flotsam.

Congratulations to Cheryl Peterson for her excellent guest editorial in the August issue of *Ahoy!* What she had to say about stealing programs is, I am afraid, all too true. As a teacher I have contact with a considerable number of students who use or would like to learn how to use computers. I have frequently been asked by students to make, or show them how to make, copies of copyrighted software. Many of these students, and other friends, think that there is nothing wrong with "sharing" special programs. I am amazed at the number of people who really don't understand that pirating software is a crime. I recently asked one young hacker if he would go into a local computer shop and walk out with a program under his jacket. He was shocked when I told him that making a copy of my *Print Shop* would be the same as taking it from the store.

A real challenge exists here for people who write for *Ahoy!*, or any of the other fine computer magazines, and teachers like myself, to educate computer users about the law and everyone's responsibility to respect the rights of others.

—Robert H. Croswell
Trappe, MD

To get straight to the point, I am a pirate. I have purchased programs at near full retail with absolutely no regret as to the price. The documentation was by itself well worth the money. I have better than one thousand pirated programs that I have traded for or copied using commercial copiers (most which were pirated themselves) or, using a machine language monitor, de-protected and copied. Several friends of mine and I trade programs between one another and have access to several networks that we can trade with. Several days ago I received 57 disks from our source in the midwest and another 35 from our west coast source. Some of these disks have as many as 6 complete programs. I am 39 years old and the average age of our group is 45, with members as young as 12. We are not in this for the profit, but rather as a means to build inexpensive libraries.

I have several suggestions that I would like to discuss with you. First of all, I wish to make an analogy to the record industry. A rock group spends as much as $250,000 to cut an album. Then they spend a tremendous amount of time and money promoting the album. The finished product is presented to the public for between $6 and $10. I think this is reasonable, and I have an extensive LP library to back this up. I could tape albums from my friends, but rarely want the entire album on one tape. The price is affordable, so I purchase what I want, and tape from that what I wish to listen to. The software industry, on the other hand, purchases many of its programs from pirate developers. They should not have any more expenses involved than does the record industry, but charge 3 to 10 times more for a program. Business programs require extensive documentation and I consider the price fair with all considerations. (If you own an IBM PC or equivalent, you get to pay a surcharge for the privilege of owning that brand.) Game programs, on the other hand, are sometimes of very poor quality and barely worth the price of a blank disk, much less $30. A lot of the time a person buys blindly, as most store clerks have trouble finding the price much less knowing anything about the content.

My solution is simple. Dongle protect the programs and keep the price around the $10 range for games, and under $50 for business programs. If the software industry is so greedy as to try to make their millions overnight, then they have to deal with the threat that people will steal their programs and give them away free as we do. A fair deal is a two way street. It must be profitable and affordable at the same time. Whatever happened to worth and value?

—Dave, a Pirate
Spokane, WA

To point the finger of guilt at the pirates and the home users who accept pirated software is legally fair, but ethically limited and based on naiveté. Let's point the finger at the real culprit, POPULAR COMPUTER MAGAZINES which advertise, for profit, "copy-all" programs. In the same issue of *Ahoy!* in which Cheryl's editorial appeared, I quickly found five (5) advertisements for disk copy-all programs, and two (2) advertisements for cartridge copiers. Isn't this the real nightmare? This practice is really setting the stage for and actively promoting the practice of piracy! How can a publisher justify running advertisements for expensive commercial software on one page and on the other page run advertisements for copy-all programs which will copy and pirate the commercial software on the previous page? The publishers will justify their actions by saying, "There is nothing wrong with advertising legitimate backup utilities!" However, software producers sell backup copies of their software at very reasonable costs.

So, Cheryl, let's shift the guilt from the bored and inquisitive pirate to the medium which has supplied the pirate with his tools. Hindsight is so clear...If computer magazine publishers had exercised better judgment a few years ago perhaps your "nightmare" would only be a mild concern and the home market would still be expanding.

—Richard N. Dawson
Marysville, MI

I refuse to make or accept copies of commercial programs. My position is based upon knowledge of the effort, time, and money involved in developing software. Regrettably, the stealing, and it is stealing, is just one more example of the 'take care of number one' attitude so prevalent these days. What I'm trying to say is, the problem is not limited to stealing software. This is not to excuse the low level of morality but to put the problem in proper perspective.

The solution is some kind of method of physically preventing the making of copies, *including potential damage to the disk drive.* I realize that this is strong medicine, but the disease calls for such a cure. Obviously, this would create a potential problem in making legitimate copies for backup purposes, but certainly vendors can address this by offering two disks within a purchase. Such an arrangement is necessary to protect the purchaser in the event that the vendor drops the product or goes out of business. —Charles A. Pocatille
Clifton, NJ

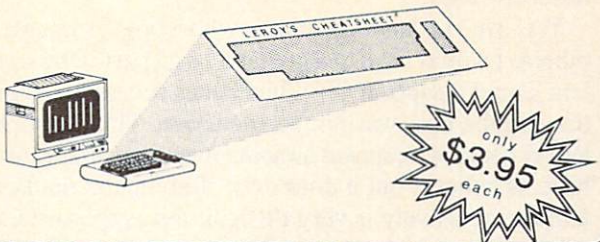
To friends who own Commodores and myself, this trend towards ignoring the home user is puzzling. Each of us spends a great deal of time on the computer. Admittedly, most of the programs in my library are ones I typed in from magazines. I can't afford to spend $40 or more on computer programs very often. But when I find something that I really want, I save my money and buy it.

The small town computer shop near my home is selling out its Commodore software and will not restock when it is gone. The owner says that no one is buying it anymore. What is really happening is that no one is buying the games and no one can afford $75 for a utility. All this says to me is that the game players are played out and the only ones left are more serious users, who are beginning to turn to other sources for functional programs.

As long as magazines like *Ahoy!* are around, I say the heck with commercial software makers. They will be left in the dust of the wave of the future. A future with a chicken in every pot, and a computer in every home. —John J. Hyland, III
Glassboro, NJ

One of the major problems we who live in small towns have is finding out about and locating new programs and products. We must rely on magazines and friends in other cities to pass new information on to us. Lately it seems that we are seeing fewer advertisements for products. What the problem is I really don't know, but if the dealers and software manufacturers would only find a way to let us know what products they have and provide us with information about them to allow us to make a choice on whether or not to purchase it, they and we would be better off. If we knew what was available, knew where to order it, and if vendors had a good return policy, we would probably be able to purchase more. Is the lack of advertisements because the publishers have raised their

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Reader Service No. 279

rates too high?

Yes, we do have members who copy programs for others. I would have to say that a large part of this problem would disappear if we had better access to the product and the cost was not so excessive. This copy problem is not as widespread as some magazine articles would have us believe, but it does exist. Relying on mail order almost exclusively is very difficult for us diehard Commodore users.

—Charles T. Cragg
Havasu Commodore Users Group
Lake Havasu City, AZ

Let's assume a small percentage of home computer users have to have everything they can get their hands on. I bet you that they will only play their favorites or use what they need. Is their illegally acquired, unused software really a threat or a loss to the manufacturer? That leaves a majority who are specifically inclined, meaning they only pirate what they want. Sadly I must admit there are also those who steal because they want to and have no intention of spending their own money. To those I say, you get back what you give.

Not all software is for everyone. I have pirated software that I didn't keep, and I have purchased software I wish I could get back my money for. It would be wonderful to try software before making the investment or have a 'satisfaction guaranteed or your money back' stipulation. Granted, some companies are service-oriented, but they are a minority.

Then there are the data management problems. Specifically, contingency planning. Most, but not all, companies make it an unnecessary inconvenience to acquire backup copies. Who wants to send a broken diskette away and then wait for a new one to be sent, especially if you're in the middle of a project?

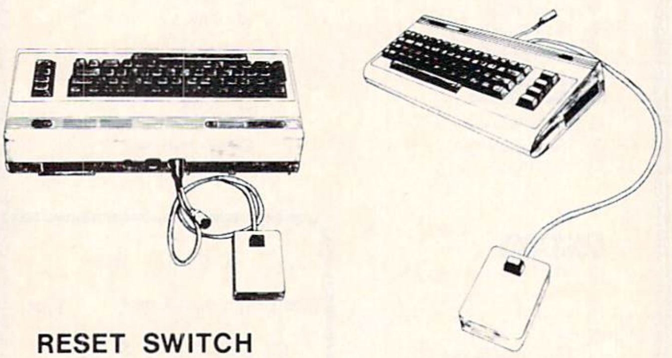
Non-customer service companies and dishonest people are escalating this piracy problem. I suggest my own policy, which is: if you have to, 'borrow' software temporarily, see if it meets your needs, and then purchase it legitimately and/or discard the pirated copy.

I must disagree with your negative prognosis of the Home Computer Industry. Just because the manufacturers aren't socking away a million plus dollars a year?

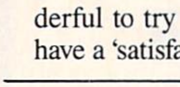
—R. Scot Derrer
Walnut Creek, CA

Why let the controversy end here? We'd be pleased to read, and possibly publish, your *views on software piracy and the future of the home computer industry—or on any other subject of interest to Commodore users. Address your correspondence to* Flotsam, *c/o* Ahoy!, *Ion International Inc., 45 West 34th St.—Suite 407, New York, NY 10001. While space limitations prevent us from publishing more than a small fraction of the letters we receive, we read each one, and answer personally where appropriate.*

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Reader Service No. 113

Ahoy! Kids America

WNYC pioneering radio program for children ages 5-12, "Small Things Considered," has gone national. The corporation for Public Broadcasting (CPB) announced that it will fund the nationwide production, broadcast and market testing of *Kids America* (formerly "Small Things Considered").

Kids America is a live, daily children's radio program produced by WNYC-AM, New York City. "Hopefully, *Kids America* will do for radio what Sesame Street and Mr. Rogers' Neighborhood did for public television," said Mary Perot Nichols, director WNYC.

AHOY! salutes WNYC management for this innovative program, C.P.B. for their foresight in supporting this project nationwide and Tom Trocco for his imaginative and unique teaching method used during his computer lesson segments (did you know that looping in computer programming is similar to playing hopscotch?).

The following areas will test market *Kids America:*

San Mateo, CA	KCSM–FM91	Cincinnati, OH	WUXU–FM91.7
Ames, IA	WOI–AM640	Rochester, NY	WXXI–FM91.5
Minneapolis, MN	WSJN–AM1330	Buffalo, NY	WBFO–FM88.7
Milwaukee, WI	WUWM–FM89.7	Boston, MA	WBUR–FM90.9
Macomb, IL	WIUM–FM91.3	New York, NY	WNYC–AM83.7

Time: 6:30 to 8:00 PM EST
Tune in and turn on to *Kids America.*

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. □

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type	You Will See
[CLEAR]	Screen Clear	SHIFT CLR/HOME	
[HOME]	Home	CLR/HOME	
[UP]	Cursor Up	SHIFT ↑CRSR↓	
[DOWN]	Cursor Down	↑CRSR↓	
[LEFT]	Cursor Left	SHIFT ←CRSR→	
[RIGHT]	Cursor Right	←CRSR→	
[SS]	Shifted Space	SHIFT Space	
[INSERT]	Insert	SHIFT INST/DEL	
[DEL]	Delete	INST/DEL	
[RVSON]	Reverse On	CNTRL 9	
[RVSOFF]	Reverse Off	CNTRL 0	
[UPARROW]	Up Arrow	↑	
[BACKARROW]	Back Arrow	←	
[PI]	PI	π	
[EP]	English Pound	£	

When You See	It Means	You Type	You Will See
[BLACK]	Black	CNTRL 1	
[WHITE]	White	CNTRL 2	
[RED]	Red	CNTRL 3	
[CYAN]	Cyan	CNTRL 4	
[PURPLE]	Purple	CNTRL 5	
[GREEN]	Green	CNTRL 6	
[BLUE]	Blue	CNTRL 7	
[YELLOW]	Yellow	CNTRL 8	
[F1]	Function 1	F1	
[F2]	Function 2	SHIFT F1	
[F3]	Function 3	F3	
[F4]	Function 4	SHIFT F3	
[F5]	Function 5	F5	
[F6]	Function 6	SHIFT F5	
[F7]	Function 7	F7	
[F8]	Function 8	SHIFT F7	

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** This and the preceding explain these codes and provide other essential information on entering **Ahoy!** programs. Read these pages **before** entering programs.

BUG REPELLENT

This program will let you debug any *Ahoy!* program. Follow instructions for VIC 20 (cassette or disk) or C-64.

VIC 20 VERSION

By Michael Kleinert and David Barron

For cassette: type in and save the *Bug Repellent* program, then type RUN 63000[RETURN]SYS 828[RETURN]. If you typed the program properly, it will generate a set of two-letter line codes that will match those listed to the right of the respective program lines.

Once you've got a working *Bug Repellent*, type in the program you wish to check. Save it and type the RUN and SYS commands listed above once again, then compare the line codes generated to those listed in the magazine. If you spot a discrepancy, a typing error exists in that line. Important: you must use exactly the same spacing as the program in the magazine. Due to memory limitations on the VIC, the VIC *Bug Repellent* will register an error if your spacing varies from what's printed.

You may type SYS 828 as many times as you wish, but if you use the cassette for anything, type RUN 63000 to restore the *Repellent*.

When your program has been disinfected you may delete all lines from 63000 on. (Be sure the program you type doesn't include lines above 63000!)

For disk: enter *Bug Repellent*, save it, and type RUN:NEW [RETURN]. Type in the program you wish to check, then SYS 828.

To pause the line codes listing, press SHIFT.

To send the list to the printer type OPEN 4,4:CMD 4:SYS 828[RETURN]. When the cursor comes back, type PRINT#4:CLOSE 4[RETURN].

```
•63000 FORX=828TO1023:READY:POKEX,Y:NEXT:END   AC
•63001 DATA169,0,133,63,133,64,165,43,133,251  JL
•63002 DATA165,44,133,252,160,0,132,254,32,228 DF
•63003 DATA3,234,177,251,208,3,76,208,3,230    OE
•63004 DATA251,208,2,230,252,169,244,160,3,32  OH
•63005 DATA30,203,160,0,177,251,170,230,251,20
8                                              KO
•63006 DATA2,230,252,177,251,32,205,221,169,58 JJ
•63007 DATA32,210,255,169,0,133,253,230,254,32 OK
•63008 DATA228,3,234,165,253,160,0,170,177,251 LG
•63009 DATA201,32,240,6,138,113,251,69,254,170 BP
•63010 DATA138,133,253,177,251,208,226,165,253
,41                                            DD
•63011 DATA240,74,74,74,74,24,105,65,32,210    EK
•63012 DATA255,165,253,41,15,24,105,65,32,210  FO
•63013 DATA255,169,13,32,210,255,173,141,2,41  PK
•63014 DATA1,208,249,230,63,208,2,230,64,230   CB
•63015 DATA251,208,2,230,252,76,74,3,169,236   KH
•63016 DATA160,3,32,30,203,166,63,165,64,32    DP
•63017 DATA205,221,169,13,32,210,255,96,230,25
1                                              EL
•63018 DATA208,2,230,252,96,0,76,73,78,69      OI
•63019 DATA83,58,32,0,76,73,78,69,32,35        FG
•63020 DATA32,0,0,0,0,0                        LE
```

C-64 VERSION

By Michael Kleinert and David Barron

Type in, SAVE, and RUN the *Bug Repellent*. Type NEW, then type in or LOAD the *Ahoy!* program you wish to check. When that's done, SAVE your program (don't RUN it!) and type SYS 49152 [RETURN].

To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to the codes listed to the right of the respective program lines. If you spot a difference, an error exists in that line. Jot down the number of lines where contradictions occur. LIST each line, spot the errors, and correct them.

```
•5000 FORX=49152TO49488:READY:POKEX,Y:NEXT:END GJ
•5001 DATA32,161,192,165,43,133,251,165,44,133 DL
•5002 DATA252,160,0,132,254,32,37,193,234,177  DB
•5003 DATA251,208,3,76,138,192,230,251,208,2   OF
•5004 DATA230,252,76,43,192,76,73,78,69,32     KN
•5005 DATA35,32,0,169,35,160,192,32,30,171     CA
•5006 DATA160,0,177,251,170,230,251,208,2,230  CE
•5007 DATA252,177,251,32,205,189,169,58,32,210 JE
•5008 DATA255,169,0,133,253,230,254,32,37,193  CL
•5009 DATA234,165,253,160,0,76,13,193,133,253  NB
•5010 DATA177,251,208,237,165,253,41,240,74,74 MB
•5011 DATA74,74,24,105,65,32,210,255,165,253   EP
•5012 DATA41,15,24,105,65,32,210,255,169,13    GH
•5013 DATA32,220,192,230,63,208,2,230,64,230   AN
•5014 DATA251,208,2,230,252,76,11,192,169,153  NG
•5015 DATA160,192,32,30,171,166,63,165,64,76   BF
•5016 DATA231,192,96,76,73,78,69,83,58,32      EP
•5017 DATA0,169,247,160,192,32,30,171,169,3    PJ
•5018 DATA133,254,32,228,255,201,83,240,6,201  FK
•5019 DATA80,208,245,230,254,32,210,255,169,4  FL
•5020 DATA166,254,160,255,32,186,255,169,0,133 CL
•5021 DATA63,133,64,133,2,32,189,255,32,192    GC
•5022 DATA255,166,254,32,201,255,76,73,193,96  NN
•5023 DATA32,210,255,173,141,2,41,1,208,249    NH
•5024 DATA96,32,205,189,169,13,32,210,255,32   IM
•5025 DATA204,255,169,4,76,195,255,147,83,67   KC
•5026 DATA82,69,69,78,32,79,82,32,80,82        DC
•5027 DATA73,78,84,69,82,32,63,32,0,76         ML
•5028 DATA44,193,234,177,251,201,32,240,6,138  GN
•5029 DATA113,251,69,254,170,138,76,88,192,0   JK
•5030 DATA0,0,0,230,251,208,2,230,252,96       NA
•5031 DATA170,177,251,201,34,208,6,165,2,73    DM
•5032 DATA255,133,2,165,2,208,218,177,251,201  JA
•5033 DATA32,208,212,198,254,76,29,193,0,169   FM
•5034 DATA13,76,210,255,0,0,0                  PA
```

FLANKSPEED FOR THE C-64

By Gordon F. Wheat

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previously saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
•5 POKE53280,12:POKE53281,11                   LL
•6 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[
15" "]";                                       ED
•10 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY P
ROGRAM[6" "]"                                  MC
•15 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[
9" "]"                                         DM
•20 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNA
```

```
TIONAL INC.[3" "]"                                   DH
30 FORA=54272TO54296:POKEA,0:NEXT                    IM
40 POKE54272,4:POKE54273,48:POKE54277,0:POKE5
4278,249:POKE54296,15                                NH
70 FORA=680TO699:READB:POKEA,B:NEXT                  KO
75 DATA169,251,166,253,164,254,32,216,255,96         HJ
76 DATA169,0,166,251,164,252,32,213,255,96           JB
80 B$="STARTING ADDRESS IN HEX":GOSUB2010:AD=
B:SR=B                                               HC
85 GOSUB2520:IFB=0THEN80                             FO
86 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16         KE
90 B$="ENDING ADDRESS IN HEX":GOSUB2010:EN=B         IF
95 GOSUB2510:IFB=0THEN80                             FP
96 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16             MN
97 IFB>255THENB=B-255:POKE254,PEEK(254)+1            GE
98 POKE253,B:PRINT                                   HN
100 REM  GET HEX LINE                                IL
110 GOSUB3010:PRINT": [c P][LEFT]";:FORA=0TO8        FG
120 FORB=0TO1:GOTO210                                MD
125 NEXTB                                            ME
130 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN310            LH
135 PRINT" [c P][LEFT]";                             IK
140 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "            PD
150 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255           LK
160 NEXT                                             IA
170 IFA%(8)<>TTHENGOSUB1010:GOTO110                  FK
180 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOT
O110                                                 MN
200 REM     GET HEX INPUT                            AB
210 GETA$:IFA$=""THEN210                             HO
211 IFA$=CHR$(20)THEN270                             GC
212 IFA$=CHR$(133)THEN4000                           MD
213 IFA$=CHR$(134)THEN4100                           KF
214 IFA$=CHR$(135)THENPRINT" ":GOTO4500              GE
215 IFA$=CHR$(136)THENPRINT" ":GOTO4700              BJ
220 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO
250                                                  GM
230 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO
250                                                  LE
240 GOSUB1100:GOTO210                                LL
250 PRINTA$"[c P][LEFT]";                            OA
260 GOTO125                                          CG
270 IFA>0THEN280                                     OP
272 A=-1:IFB=1THEN290                                OB
274 GOTO140                                          CJ
280 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1           HG
285 A=A-1                                            BE
290 PRINTCHR$(20);:GOTO140                           KH
300 REM LAST LINE                                    AD
310 PRINT" ":T=AD-(INT(AD/256)*256)                  GJ
320 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255         PL
330 NEXT                                             IA
340 IFA%(A)<>TTHENGOSUB1010:GOTO110                  KF
350 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                  HN
360 PRINT:PRINT"YOU ARE FINISHED!":GOTO4000          ON
1000 REM BELL AND ERROR MESSAGES                     FL
1010 PRINT:PRINT"LINE ENTERED INCORRECTLY":PR
INT:GOTO1100                                         DH
1020 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":
GOTO1100                                             JA
1030 PRINT:PRINT"ENDING IS LESS THAN STARTING
!":B=0:GOTO1100                                      HD
1040 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED
 RANGE!":B=0:GOTO1100                                AG
1050 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:G
OTO1100                                              KN
1060 PRINT"?ERROR IN SAVE":GOTO1100                  EI
1070 PRINT"?ERROR IN LOAD":GOTO1100                  GL
1080 PRINT:PRINT:PRINT"END OF ML AREA":PRINT         PG
1100 POKE54276,17:POKE54276,16:RETURN                BH
1200 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA
$:RETURN                                             IM
2000 REM GET FOUR DIGIT HEX                          PC
2010 PRINT:PRINTB$;:INPUTT$                          GM
2020 IFLEN(T$)<>4THENGOSUB1020:GOTO2010              II
2040 FORA=1TO4:A$=MID$(T$,A,1):GOSUB2060:IFT(
A)=16THENGOSUB1020:GOTO2010                          AD
2050 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+
T(4):RETURN                                          GF
2060 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RET
URN                                                  EH
2070 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RET
URN                                                  KP
2080 T(A)=16:RETURN                                  NP
2500 REM ADRESS CHECK                                LI
2510 IFAD>ENTHEN1030                                 MI
2515 IFB<SRORB>ENTHEN1040                            MG
2520 IFB<256OR(B>40960ANDB<49152)ORB>53247THE
N1050                                                MI
2530 RETURN                                          IM
3000 REM ADDRESS TO HEX                              EB
3010 AC=AD:A=4096:GOSUB3070                          HG
3020 A=256:GOSUB3070                                 CE
3030 A=16:GOSUB3070                                  PN
3040 A=1:GOSUB3070                                   MJ
3060 RETURN                                          IM
3070 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO3
090                                                  CJ
3080 A$=CHR$(T+48)                                   JP
3090 PRINTA$;:AC=AC-A*T:RETURN                       AC
4000 A$="**SAVE**":GOSUB4200                         AI
4050 OPEN1,T,1,A$:SYS680:CLOSE1                      LH
4060 IFST=0THENEND                                   EO
4070 GOSUB1060:IFT=8THENGOSUB1200                    FJ
4080 GOTO4000                                        FF
4100 A$="**LOAD**":GOSUB4200                         AB
4150 OPEN1,T,0,A$:SYS690:CLOSE1                      MF
4160 IFST=64THEN110                                  JH
4170 GOSUB1070:IFT=8THENGOSUB1200                    CM
4180 GOTO4100                                        FO
4200 PRINT" ":PRINTTAB(14)A$                         FG
4210 PRINT:A$="":INPUT"FILENAME";A$                  OM
4215 IFA$=""THEN4210                                 GF
4220 PRINT:PRINT"TAPE OR DISK?":PRINT                DF
4230 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RE
TURN                                                 IG
4240 IFB$<>"T"THEN4230                               FN
4250 RETURN                                          IM
4500 B$="CONTINUE FROM ADDRESS":GOSUB2010:AD=
B                                                    DK
4510 GOSUB2515:IFB=0THEN4500                         MA
4520 PRINT:GOTO110                                   OI
4700 B$="BEGIN SCAN AT ADDRESS":GOSUB2010:AD=
B                                                    FH
4705 GOSUB2515:IFB=0THEN4700                         NK
4706 PRINT:GOTO4740                                  DI
4710 FORB=0TO7:AC=PEEK(AD+B):GOSUB3030:IFAD+B
=ENTHENAD=SR:GOSUB1080:GOTO110                       BK
4715 PRINT" ";:NEXTB                                 EC
4720 PRINT:AD=AD+8                                   GN
4730 GETB$:IFB$=CHR$(136)THEN110                     MN
4740 GOSUB3010:PRINT": ";:GOTO4710                   JD
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 121 and 122 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

MONKEY BUSINESS

FROM PAGE 37

STRICTLY RANDOM

```
2 REM RUPERT REPORT #23:MONKEY BUSINESS  GL
3 REM      >> STRICTLY RANDOM  <<         JJ
4 REM                                     JD
5 REM SIMULATE A MONKEY AT A NORMAL       JG
6 REM 'ONE KEY PER CHARACTER'             FM
7 REM TYPEWRITER KEYBOARD.                CE
8 REM                                     JD
10 A$=" ABCDEFGHIJKLMNOPQRSTUVWXYZ"       PC
20 N=27*RND(0)+1 : PRINT MID$(A$,N,1);    CM
30 GOTO 20                                OK
```

WEIGHTED KEYBOARD

```
2 REM RUPERT REPORT #23:MONKEY BUSINESS   GL
3 REM     >> WEIGHTED KEYBOARD <<         CB
4 REM                                     JD
5 REM SIMULATE A MONKEY AT A SPECIAL      CK
6 REM KEYBOARD WITH NUMBERS OF KEYS       HN
7 REM IN PROPORTION TO THE FREQUENCY OF   ML
8 REM EACH LETTER'S USAGE IN ENGLISH.     CH
9 REM                                     JD
100 DATA 275," ",130,E,92,T,79,N          HL
101 DATA 76,R,75,O,74,A,74,I,61,S         FF
102 DATA 42,D,36,L,34,H,31,C,28,F         BK
103 DATA 27,P,26,U,25,M,19,Y,16,G         MO
104 DATA 16,W,15,V,10,B,5,X,3,Q           CG
105 DATA 3,K,2,J,1,Z,-1,*                 LG
185 REM -- PACK STRINGS WITH LETTERS --   AK
190 PRINT CHR$(147) "TOTAL = 0"           MM
200 CT=0 : IX=0 : TTL=0                   EH
210 READ N,C$ :NCT=0 :IF N=-1 THEN 300    IG
220 A$(IX)=A$(IX)+C$                      DK
230 NCT=NCT+1 : CT=CT+1 : TTL=TTL+1       AA
240 IF CT=255 THEN CT=0 : IX=IX+1         FE
250 IF NCT<N THEN 220                     KA
260 PRINT CHR$(19)TAB(7) TTL : GOTO 210   FG
295 REM    -- PICK AND PRINT LETTERS --   EI
300 K=INT(RND(0)*TTL)                     OB
310 X=INT(K/255) : CH=K-X*255+1           KF
320 L$=MID$(A$(X),CH,1)                   JA
330 PRINT L$;                             EJ
340 GOTO 300                              BP
```

GETTING GRAPHIC

FROM PAGE 91

BALLBOUNCE.BAS

```
10 REM **** BALLBOUNCE.BAS ****           IF
20 PRINT CHR$(147):REM CLEAR SCREEN       EG
30 BALL=81:SPACE=96:RULE=99:REM CODES TO
 PRINT THINGS ON THE SCREEN               GM
40 FOR L=55616 TO 55975:POKE L,2:NEXT L:
REM MAKE BALL RED                         NM
50 FOR L=55976 TO 56015:POKE L,7:NEXT L:
REM MAKE FLOOR YELLOW                     JI
60 POKE 53281,0:POKE 53280,6:REM BLACK B
ACKGROUND, BLUE BORDER                    NB
70 PRINT CHR$(5):REM WHITE TEXT           JM
80 PRINT:PRINT:PRINT "[5" "]FOLLOW THE B
OUNCING BALL . . ."                       JG
90 FOR L=1704 TO 1743:POKE L,RULE:NEXT L
:REM DRAW FLOOR                           FK
100 PSN=1664:CT=1:REM STARTING POSITION
AND FRAME COUNTER                         FK
110 FOR INC=1 TO 8:GOSUB 210:REM THIS LO
OP DRAWS THE BALL GOING UP                EH
120 PSN=PSN-40+1:REM THE BALL GOES UP     HL
130 IF CT>40 THEN PSN=1344:CT=1:GOTO 150
:REM BALL OFF SCREEN--BACK TO BEGINNING   FI
140 NEXT INC                              GD
150 FOR DEC=1 TO 8:GOSUB 210:REM THIS LO
OP DRAWS THE BALL COMING DOWN             MJ
160 PSN=PSN+41:REM THE BALL COMES DOWN    HK
170 IF CT>40 THEN 100:REM BALL OFF SCREE
N -- LOOP BACK                            FA
180 NEXT DEC                              EN
190 GOTO 110:REM DONE--START AGAIN        KC
200 REM **** PRINT BALL ON SCREEN ****    PI
210 POKE PSN,BALL                         MH
220 FOR L=1 TO 50:NEXT L                  OH
230 POKE PSN,SPACE                        CC
240 CT=CT+1:RETURN                        HB
250 END                                   IC
```

BLACKBOARD.BAS

```
10 REM *** "BLACKBOARD.BAS" *******       OJ
20 BASE=2*4096:POKE 53272,PEEK(53272)OR8
:REM PUT HIGH-RES MAP AT 8192             CP
30 POKE 53265,PEEK(53265)OR32:REM ENTER
HIGH-RES BIT-MAP MODE                     NJ
40 FOR I=BASE TO BASE+7999:POKE I,0:NEXT
:REM CLEAR BIT MAP                        KJ
50 FOR I=1024 TO 2023:POKE I,16:NEXT I:R
EM BLACK BACKGROUND, WHITE LINE           NI
60 GOTO 200                               BO
80 REM ****** PLOT ROUTINE **********     KH
90 CHAR=INT(HPSN/8)                       PA
100 ROW=INT(VPSN/8)                       LI
110 LINE=VPSN AND 7                       PM
120 BYTE=BASE+ROW*320+8*CHAR+LINE         KG
130 BIT=7-(HPSN AND 7)                    OP
140 POKE BYTE,PEEK(BYTE) OR (2[UPARROW]B
IT)                                       DO
150 RETURN                                IM
200 REM **** DRAW VERTICAL LINE *******   DE
220 FOR VPSN=0 TO 199:REM PLOT LINE FROM
 TOP TO BOTTOM OF SCREEN                  IG
```

```
·225 FOR HPSN=159 TO 160                    EE
·230 GOSUB 80                               PM
·240 NEXT HPSN:NEXT VPSN                    NP
·245 REM *** DRAW HORIZONTAL LINE ******     NA
·250 VPSN=100:REM HALFWAY DOWN SCREEN       LK
·260 FOR HPSN=0 TO 319:REM PLOT LINE FROM
  LEFT SIDE TO RIGHT SIDE OF SCREEN         HB
·270 GOSUB 80                               PM
·280 NEXT HPSN                              LL
·290 GOTO 290                               CH
```

INSTANT BUG REPELLENT

FROM PAGE 73

```
·10 SA=49152                                FI
·20 FORI=100TO148:ZZ=0:FORJ=1TO8:READA:PO
KESA,A:SA=SA+1:ZZ=ZZ+A:NEXTJ                FO
·30 READA:IF ZZ=ATHEN CK=CK+ZZ:NEXT I:GOT
O50                                         KN
·40 PRINT" ERROR IN LINE #";I:END           AM
·50 IF SA-CK=1377 THEN SYS49152:NEW         EL
·100 DATA 169,90,141,2,3,169,192,141,907    KI
·101 DATA 3,3,160,0,185,37,192,240,820      NG
·102 DATA 6,32,210,255,200,208,245,169,13
25                                          LF
·103 DATA 1,133,251,169,8,133,252,165,111
2                                           DG
·104 DATA 0,141,167,2,96,18,32,73,529       ND
·105 DATA 78,83,84,65,78,84,32,66,570       FP
·106 DATA 85,71,32,82,69,80,69,76,564       LG
·107 DATA 76,69,78,84,32,13,0,40,392        AK
·108 DATA 104,170,104,168,104,76,131,164,
1021                                        EJ
·109 DATA 160,0,177,251,240,1,96,200,1125   IJ
·110 DATA 177,251,240,1,96,104,104,76,104
9                                           IN
·111 DATA 63,192,72,152,72,138,72,8,769     EH
·112 DATA 165,157,208,3,76,63,192,169,103
3                                           PE
·113 DATA 1,133,251,169,8,133,252,169,111
6                                           DO
·114 DATA 0,133,254,133,255,165,20,133,10
93                                          LM
·115 DATA 254,165,21,133,255,32,72,192,11
24                                          KM
·116 DATA 160,2,177,251,197,254,240,6,128
7                                           ND
·117 DATA 32,105,193,24,144,239,200,177,1
114                                         HB
·118 DATA 251,197,255,240,6,32,105,193,12
79                                          FL
·119 DATA 24,144,226,169,1,133,254,169,11
20                                          BD
·120 DATA 0,133,255,165,251,24,105,4,937    IC
·121 DATA 133,251,165,252,105,0,133,252,1
291                                         CH
·122 DATA 169,0,160,0,169,0,141,167,806     KI
·123 DATA 2,240,38,133,255,177,251,208,13
04                                          KI
·124 DATA 27,165,255,41,240,74,74,74,950    JJ
·125 DATA 74,24,105,129,141,2,4,165,644     IO
·126 DATA 255,41,15,24,105,129,141,3,713    DL
·127 DATA 4,76,15,193,230,254,32,84,888     FE
·128 DATA 193,165,255,160,0,170,177,251,1
371                                         BD
·129 DATA 201,34,208,8,173,167,2,73,866     KA
·130 DATA 255,141,167,2,173,167,2,208,111
5                                           IO
·131 DATA 12,177,251,201,32,208,6,198,108
5                                           IH
·132 DATA 254,138,76,187,192,138,113,251,
1349                                        MA
·133 DATA 69,254,170,138,76,187,192,169,1
255                                         EG
·134 DATA 160,141,0,4,169,186,141,1,802     LA
·135 DATA 4,160,0,185,127,193,240,6,915     CE
·136 DATA 153,4,4,200,208,245,234,165,121
3                                           AJ
·137 DATA 20,133,99,165,21,133,98,162,831   KH
·138 DATA 144,56,32,73,188,32,221,189,935   PL
·139 DATA 162,0,189,1,1,240,10,41,644       NJ
·140 DATA 63,9,128,157,12,4,232,208,813     AL
·141 DATA 241,169,160,157,12,4,32,91,866    NH
·142 DATA 193,76,63,192,230,251,208,2,121
5                                           CG
·143 DATA 230,252,96,173,134,2,160,0,1047   JH
·144 DATA 153,0,216,200,192,21,144,248,11
74                                          KG
·145 DATA 96,160,0,177,251,170,32,84,970    DG
·146 DATA 193,177,251,133,252,138,133,251
,1528                                       KO
·147 DATA 96,0,0,0,0,0,0,160,256            AN
·148 DATA 140,137,142,133,160,163,160,0,1
035                                         HH
```

INTERRUPTING YOUR WAY TO FAST MOTION

FROM PAGE 18

BORDER INTERRUPT

```
·1 REM PROGRAMMING IN THE IRQ INTERRUPT     GH
·7 REM RUN THIS PROGRAM, THEN TYPE CHARAC
TERS IN UPPER LEFTHAND CORNER OF SCREEN     AB
·8 REM THE BORDER COLOR WILL CHANGE, DEPE
NDING ON SCREEN CODE OF CHARACTER           DB
·9 REM 13-BYTE PROGRAM SETS UP THE INTERR
UPT: 11-BYTE PROGRAM RUNS IT                FE
·10 FOR I=5011 TO 5023:READ A:POKE I,A:NE
XT                                          CK
·20 FOR I=5000 TO 5010:READ A:POKE I,A:NE
XT                                          NK
·30 SYS 5011                                GH
```

```
•40 END                                         IC
•47 REM  *** SYS CALL TO SET INTERRUPT VE
 CTOR                                           JA
•48 REM BLOCK INTERRUPTS, SET VECTOR ADDR
 ESS (LOW, HIGH), ENABLE INTERRUPTS             GI
•49 REM  SEI LDA#136 STA 788  LDA#19 STA
 789 CLI RTS                                    BH
•50 DATA 120,169,136,141,20,3,169,19,141,
 21,3,88,96                                     EH
•57 REM  *** ACTUAL INTERRUPT ROUTINE           EI
•58 REM GET FIRST SCREEN CHARACTER; USE L
 OW NYBBLE TO SET BORDER COLOR                  NG
•59 REM LDA 1024 AND#15 STA 53280 JMP 599
 53                                             NJ
•60 DATA 173,0,4,41,31,141,32,208,76,49,2
 34                                             MG
```

STARSHIP

```
•1 REM      ***  STARSHIP  ***                  OE
•2 REM MACHINE LANGUAGE SPRITE MOVEMENT         GK
•4 REM ** MOVE TOP OF MEMORY TO MAKE ROOM
  FOR VIDEO BLOCK AT 32768                      CA
•5 POKE 55,255:POKE 56,127:POKE 643,255:P
 OKE 644,127:PRINT "[CLEAR]"                    KE
•6 REM ** DECLARE PRIMARY VARIABLES             GG
•7 F$=" ":C0%=0:C1%=0:C2%=0:C3%=0:C4%=0:C
 5%=0:C6%=0:SP%=0                               NO
•8 DEF FN PG(X)=INT(X/256):DEF FN LO(X)=X
 -256*(INT(X/256))                              EF
•9 REM      *** SET-UP SUBROUTINES ***          OF
•10 GOSUB 90:GOSUB 600:REM (VIDEO MEMORY)       PO
•12 PRINT "[CLEAR]";:GOSUB 95:GOSUB 700:G
 OSUB 2000:REM (MACHINE LANGUAGE AND SPRI
 TES)                                           PH
•13 GOSUB 900:REM (SPRITE POSITIONS AND G
 AME SCREEN)                                    HN
•14 SYS 38067:REM (START INTERRUPT!)            BM
•15 REM ** ENABLE SPRITES                       OD
•16 FOR I=0 TO 29:NEXT:POKE ES,31:REM (SP
 RITES 0-4)                                     NF
•17 GOTO 100                                    CF
•19 REM ** LOAD SUBROUTINE                      GD
•20 FOR I=XB TO XE:READ A:POKE I,A:NEXT:P
 RINT "[RVSON].[RVSOFF]";:RETURN                MG
•89 REM TURN OFF SCREEN                         GF
•90 POKE 53265,0:RETURN                         MO
•94 REM TURN ON SCREEN (AND EXTENDED BACK
 GROUND COLOR TEXT MODE)                        JD
•95 POKE 53265,91:RETURN                        PH
•98 REM      *** ACTION LOOP ***                KJ
•100 K=PEEK(653):IF K=7 THEN 300                OF
•110 FOR I=1 TO 4:SP%=I:SYS 38336:NEXT          AN
•115 PRINT "[HOME][5" "][HOME][DOWN][6" "
 ][HOME][DOWN][DOWN][6" "][HOME][3"[DOWN]
 "][5" "]"                                      JC
•120 ON C0% GOSUB 200:C0%=0:C4%=0:C5%=0:C
 6%=0                                           LK
•125 FOR I=1 TO 4:SP%=I:SYS 38336:NEXT          AN
•130 IF C1%>0 THEN GOSUB 220:C1%=0              KG
•135 IF C2%>0 THEN GOSUB 240:C2%=0              OC
•140 IF C3%>0 THEN GOSUB 260:C3%=0              LC
•196 GOTO 100                                   CF
•199 REM ** FIREBUTTON ROUTINE GOES HERE        FE
•200 PRINT "[HOME]F"                            DJ
•201 IF C4%=1 THEN PRINT "[HOME][RIGHT][R
 IGHT]!"                                        BG
•202 IF C5%>1 THEN PRINT "[HOME][4"[RIGHT
 ]"]S"                                          JA
•203 IF C6%=1 THEN PRINT "[HOME][6"[RIGHT
 ]"]F"                                          IC
•205 RETURN                                     IM
•220 PRINT "[HOME][3"[DOWN]"]EW"STR$(C1%)
 :RETURN                                        DD
•239 REM ** SPR/SPR COLLISION ROUTINE           NC
•240 PRINT "[HOME][DOWN]CS"STR$(C2%):RETU
 RN                                             BD
•259 REM ** SPR/FORE COLLISION ROUTINE          AG
•260 PRINT "[HOME][DOWN][DOWN]CF"STR$(C3%
 ):RETURN                                       CH
•296 RETURN                                     IM
•298 REM      *** END HANDLING ***              AB
•299 REM ** PUT VIDEO MEMORY BACK TO FIRS
 T BLOCK, AND SCREEN MEMORY TO 1024             EG
•300 GOSUB 90:POKE ES,0:REM DISABLE SPRIT
 ES                                             LO
•304 REM RESTORE VIDEO/SCREEN MEMORY            AK
•305 POKE 56578,PEEK(56578)OR3:POKE 56576
 ,(PEEK(56576)AND 252)OR 3                      MB
•306 I=PEEK(53272):POKE 53272,20:K=PEEK(6
 48):POKE 648,4                                 JJ
•310 GOSUB 95:PRINT "[CLEAR]QUIT? ([RVSON
 ][s Y][RVSOFF] OR [RVSON][s N][RVSOFF])"
 :PRINT:PRINT                                   EP
•315 GET A$:IF A$="" THEN 315                   HO
•320 IF A$="Y" THEN PRINT "[HOME]SO LONG,
  STAR PILOT!":GOTO 370                         AL
•325 GOSUB 90:POKE 56578,PEEK(56578)OR3:P
 OKE 56576,(PEEK(56576)AND 252)OR 1             PN
•330 POKE 53272,I:POKE 648,K:POKE ES,31:G
 OSUB 95:GOTO 100                               FK
•370 FOR I=0 TO 599:NEXT                        MF
•379 REM ** REENABLE SHIFT/COMMODORE AND
 RUN-STOP/RESTORE                               FB
•380 POKE 657,0:POKE 792,71:POKE 808,237        PK
•390 SYS 65126                                  KI
•598 REM      *** ARRANGE MEMORY ***            KB
•599 REM USE THIRD VIDEO BLOCK (32768 TO
 49151), SO ROM CHARACTER SET IS USABLE.        AL
•600 VB=32768:POKE 56578,PEEK(56578)OR3:P
 OKE 56576,(PEEK(56576)AND 252)OR 1             CN
```

```
·601 REM ** TELL VIC-2 WHERE SCREEN IS WI
 THOUT CHANGING CHARACTER SET LOCATION   GA
·602 SB=0:POKE 53272,(SB*16)+4:SB=VB+1024
 *SB                                     MO
·603 REM ** TELL BASIC WHERE SCREEN IS   GB
·604 BB=SB/256:POKE 648,BB               AK
·608 REM     *** REGISTER ADDRESSES ***  EJ
·611 REM ** SPRITE COLOR TABLE           LA
·612 CT(0)=53287:FOR I=1 TO 7:CT(I)=CT(I-
 1)+1:NEXT                               AN
·613 REM ** SPRITE HORIZONTAL POSITION TA
 BLE (LOW BYTES)                         CH
·614 HT(0)=53248:FOR I=1 TO 7:HT(I)=HT(I-
 1)+2:NEXT                               KC
·615 REM ** SPRITE VERTICAL POSITION TABL
 E                                       IJ
·616 VT(0)=53249:FOR I=1 TO 7:VT(I)=VT(I-
 1)+2:NEXT                               AJ
·617 REM ** SPRITE HORIZONTAL HIGH-BIT RE
 GISTER                                  IG
·618 HR=53264                            FB
·619 REM ** SPRITE ENABLE REGISTER       AF
·620 ES=53269                            FE
·621 REM ** VERTICAL EXPANSION REGISTER (
 1=DOUBLE HEIGHT)                        IB
·622 VE=53271                            GC
·623 REM ** HORIZONTAL EXPANSION REGISTER
  (1=DOUBLE WIDTH)                       PL
·624 HE=53277                            FC
·625 REM ** SPRITE PRIORITY REGISTER (1=S
 PRITE IS IN FRONT OF FOREGROUND)        GM
·626 PR=53275                            FJ
·627 REM ** MULTICOLOR ENABLE REGISTER (1
 =MULTI-COLOR ENABLED)                   IM
·628 EM=53276                            EK
·629 REM ** SPRITE MULTICOLOR COLOR REGIS
 TERS                                    OH
·630 MR=53285:REM ('01' REGISTER: ADD 1 T
 O MR FOR '11' REGISTER)                 LJ
·633 REM ** SET-BIT AND CLEAR-BIT VALUES BI
·634 BS(0)=1:FOR I=1 TO 7:BS(I)=2*BS(I-1)
 :NEXT                                   NE
·635 FOR I=0 TO 7:BC(I)=255-BS(I):NEXT   LB
·638 REM     *** INITIALIZE VALUES ***   DK
·639 REM ** FOREGROUND COLOR             FL
·640 POKE 53281,0:PRINT "[CLEAR][c 7]";:R
 EM (LIGHT BLUE)                         GM
·641 REM ** BACKGROUND COLOR             DK
·642 POKE 53281,0 :REM (BLACK)           JB
·643 REM ** BORDER COLOR                 BE
·644 POKE 53280,0:REM (BLACK)            II
·645 REM ** SPRITE COLORS (DEFAULTS: WHI,
 RED,L-GRN,PUR,GRN,BLU,YEL,M-GRAY)       IE
·646 POKE CT(0),7:POKE CT(1),5:POKE CT(2)
 ,2:POKE CT(3),6:POKE CT(4),12           EE
·647 REM ** SET PRIORITY                 EF
·648 POKE PR,0:REM (ALL IN FRONT)        OD
·649 REM ** SET HORIZONTAL SIZES         BJ
·650 POKE HE,0:REM (ALL SMALL)           CA
·651 REM ** SET VERTICAL SIZES           CC
·652 POKE VE,0:REM (ALL SMALL)           AK
·653 REM ** ENABLE SPRITES               OD
·654 POKE ES,0:REM (LEAVE THEM OFF FOR NO
 W)                                      KD
·655 REM ** ENABL MULTICOLOR FOR SPR 1-4 DA
·656 POKE EM,30                          LA
·657 REM ** SET MULTI-COLORS 1 AND 3 (1=L
 IGHT GREY, 3=YELLOW)                    HE
·658 POKE MR,15:POKE MR+1,7              JA
·659 REM       *** ML TABLE SETUP ***    CA
·660 REM ** ANIMATION TIMER (1=FASTEST)  OE
·661 POKE 37920,4:POKE 37921,4           CB
·662 REM ** ANIMATION COUNTER (ALWAYS 1) AD
·663 POKE 37922,1                        PO
·664 REM ** ANIMATE SPRITE 0?  (1=YES)   NK
·665 POKE 37923,0                        PA
·666 REM ** MOVEMENT TIMER (NUMBER OF INT
 ERRUPTS BETWEEN MOVES [1=FASTEST])      LD
·667 POKE 37924,1:POKE 37925,1           FL
·668 REM ** ALL SPRITES WRAP AT SCREEN ED
 GE? (1=YES)                             JL
·669 POKE 37936,1                        AJ
·670 REM ** SPRITE 0 BOUNCE OFF SPRITES?
 (1=YES)                                 BK
·671 POKE 37940,1                        PO
·672 REM ** SPRITE 0 BOUNCE OFF FOREGROUN
 D? (1=YES)                              AH
·673 POKE 37941,0                        PA
·674 REM ** GO-SPEED TIMER (NUMBER OF SPR
 ITE 0 MOVES PER INTERRUPT [1=SLOWEST])  MH
·675 POKE 37926,3:POKE 37928,3           GI
·676 REM CLEAR FLAGS                     II
·677 POKE 37927,0:POKE 37935,0:POKE 37943
 ,0                                      MA
·678 REM ** EXTENDED BACKGROUND COLORS   IP
·679 POKE 53282,1:POKE 53283,7:POKE 53284
 ,9                                      GD
·683 REM ** SPRITE 0-7 BIT TABLE         HC
·684 X=1:FOR I=37962 TO 37969:POKE I,X:X=
 X*2:NEXT                                DN
·693 REM      *** SAFETY PROCEDURES ***  CM
·694 POKE 657,128:REM DISABLE SHIFT/COMMO
 DORE CHARACTER SET SWITCH               OA
·695 REM POKE 808,234:POKE 792,193:REM DI
 SABLE STOP AND STOP/RESTORE             GH
·696 RETURN                              IM
·699 REM *** INTRO SCREEN ***            PN
·700 PRINT "[CLEAR][5"[DOWN]"]"TAB(12)"[s
  S][s T][s A][s R][s S][s H][s I][s P][S
 S][s C][s A][s P][s T][s A][s I][s N]"  PK
·710 PRINT:PRINT TAB(6)"[RVSON][s Y][s O]
 [s U][s R][SS][s C][s R][s A][s F][s T][
 SS][s I][s S][SS][s B][s E][s I][s N][s
 G][SS][s P][s R][s E][s P][s A][s R][s E
 ][s D][RVSOFF]":PRINT:PRINT             OE
·796 RETURN                              IM
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·898 REM      *** SPRITE POSITIONS ***       KA
·899 REM ** POSSIBLE POSITIONS DIM'ED        MK
·900 FOR I=1 TO 4:POKE HT(I),20+INT(RND(9
)*220)                                       DK
·901 POKE VT(I),50+INT(RND(9)*190):NEXT      JM
·902 POKE HR,0                               IJ
·909 REM ** PUT STARS ON THE SCREEN          MF
·910 PRINT "[CLEAR]";:FOR I=0 TO 49:POKE
VB+INT(RND(9)*1024),46:NEXT                  EO
·915 FOR I=0 TO 8:POKE VB+INT(RND(9)*1024
),42:NEXT                                    IK
·919 REM ** STARSHIP POSITION                LP
·920 POKE 53248,175:POKE 53249,150           AE
·921 REM ** STARSHIP DIRECTION               CN
·922 POKE VB+1016,16                         ED
·946 RETURN                                  IM
·1998 REM     ***  MACHINE LANGUAGE  ***     OA
·1999 REM ** STARTUP SYS ROUTINE             JO
·2000 POKE 37888,PEEK(788):POKE 37889,PEE
K(789)                                       LB
·2002 XB=38067:XE=38079:GOSUB 20             BF
·2003 REM BLOCK INTERR, SET VECTOR TO ANI
MATION SHELL,ENABLE INTERR                   CG
·2004 REM SEI LDA #0 STA 788 LDA #149 STA
 789 CLI RTS                                 CM
·2005 DATA 120,169,0,141,20,3,169,149,141
,21,3,88,96                                  HC
·2019 REM    ***  ANIMATION SHELL  ***       KJ
·2020 XB=38144:XE=38176:GOSUB 20             DD
·2021 REM SEE IF TIMER CALLS FOR ANIMATIO
N OR MOVEMENT                                CM
·2022 REM DEC 37920 BEQ+3 JMP(37898)         EG
·2023 DATA 206,32,148,240,3,108,10,148       BE
·2024 REM RESET ANIMATION TIMER              BA
·2025 REM LDA 37921 STA 37920                IJ
·2026 DATA 173,33,148,141,32,148             ED
·2027 REM GET NEXT STEP IN ANIMATION SEQU
ENCE                                         ON
·2028 REM DEC 37922 BNE+5 LDA#8 STA 37922
 LDX 37922 DEX                               CG
·2029 DATA 206,34,148,208,5,169,8,141,34,
148,174,34,148,202                           OK
·2030 REM IF CALLED FOR, ANIMATE #0          GE
·2031 REM LDA 37923 BEQ+6                    MH
·2032 DATA 173,35,148,240,6                  LH
·2033 REM ANIMATE ALL SPRITES                KN
·2034 REM LDA ANIM.SEQ.TAB,X STA SPRITE.S
HAPE.TAB                                     FC
·2035 A=192:B=248:FOR I=38177 TO 38219 ST
EP 6:POKE I,189:POKE I+1,A:POKE I+2,148      MN
·2036 POKE I+3,141:POKE I+4,B:POKE I+5,13
1:A=A+8:B=B+1:NEXT                           BG
·2037 REM EXIT THROUGH MOVEMENT HANDLER      GA
·2038 REM JMP (37898)                        PF
·2039 POKE 38225,108:POKE 38226,10:POKE 3
8227,148                                     KK
·2049 REM    *** MOVEMENT COUNTER ***        HI
·2050 XB=38272:XE=38288:GOSUB 20             EL
·2051 X=38272:POKE 37896,FN LO(X):POKE 37
897,FN PG(X):REM SET COUNTER ADDRESS         AA
·2052 POKE 37898,FN LO(X):POKE 37899,FN P
G(X):REM MOVE.VECT.=JOYDIR                   CD
·2053 REM DECREMENT TIMER; IF NOT 0, GO F
INISH UP                                     LI
·2054 REM DEC 37924 BEQ+3 JMP(37900)         BI
·2055 DATA 206,36,148,240,3,108,12,148       GC
·2056 REM RESET TIMER AND JUMP TO READ RO
UTINE THROUGH VECTOR SET FROM BASIC          CM
·2057 REM LDA 37925 STA 37924 JMP(37890)     KP
·2058 DATA 173,37,148,141,36,148,108,2,14
8                                            EA
·2059 REM ** BITSET SUBROUTINE **            EI
·2060 XB=38314:XE=38323:GOSUB 20             BM
·2061 REM GET BITMASK AND PUT IT IN HORIZ
ONTAL HI-BIT REGISTER                        PE
·2062 REM LDA 37962,Y ORA 53264 STA 53264
 RTS                                         EL
·2063 DATA 185,74,148,13,16,208,141,16,20
8,96                                         EH
·2069 REM ** BITCLEAR SUBROUTINE **          KG
·2070 XB=38324:XE=38335:GOSUB 20             CK
·2071 REM GET BITMASK, REVERSE IT, AND PU
T IT IN HORIZONTAL HI-BIT REGISTER           KM
·2072 REM LDA 37962,Y EOR#255 AND 53264 S
TA 53264 RTS                                 JP
·2073 DATA 185,74,148,73,255,45,16,208,14
1,16,208,96                                  CF
·2099 REM        *** XMOVE ***               EL
·2100 XB=38400:XE=38467:GOSUB 20             CJ
·2101 REM TEST FOR UPMOVE                    JG
·2102 REM LDA#1 AND 37963,Y BEQ+3 JSR 385
28                                           PF
·2103 DATA 169,1,57,75,148,240,3,32,128,1
50                                           GE
·2107 REM TEST FOR DOWNMOVE                  DO
·2108 REM LDA#2 AND 37963,Y BEQ+3 JSR 385
92                                           IJ
·2109 DATA 169,2,57,75,148,240,3,32,192,1
50                                           CM
·2117 REM TEST FOR LEFTMOVE AND HI-BIT       ME
·2118 REM LDA#4 AND 37963,Y BEQ+17 LDA 37
962,Y AND 53264 BEQ+6                        JB
·2119 DATA 169,4,57,75,148,240,17,185,74,
148,45,16,208,240,6                          KM
·2120 REM DO EITHER LEFTSET OR LEFTCLEAR     AM
·2121 REM JSR 38656 JMP 38444 JSR 38720      AH
·2122 DATA 32,0,151,76,44,150,32,64,151      FE
·2126 REM TEST FOR RIGHTMOVE AND HI-BIT      AN
·2127 REM LDA#8 AND 37963,Y BNE+1 RTS LDA
 37962,Y AND 53264 BEQ+4                     FD
·2128 DATA 169,8,57,75,148,208,1,96,185,7
4,148,45,16,208,240,4                        HN
·2129 REM DO EITHER RIGHTSET OR RIGHTCLEA
R                                            JL
·2130 REM JSR 38784 JMP 38515 JSR 38848 R
TS                                           CH
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•2131 DATA 32,128,151,96,32,192,151,96   OB
•2139 REM   *** UPMOVE SUBROUTINE ***   NE
•2140 XB=38528:XE=38561:GOSUB 20   BL
•2141 REM GET VERT.LOC.,DECREMENT,CHECK E
DGE,STORE NEW VERT.LOC.   BH
•2142 REM LDX 53249,Y DEX TXA CMP 37978,Y
 BNE+3 JSR 38546 TXA STA 53249,Y RTS   FB
•2143 DATA 190,1,208,202,138,217,90,148,2
08,3,32,146,150,138,153,1,208,96   BB
•2144 REM * TOPCHECK   BC
•2145 REM LDA 37936 BNE+4 INX JMP 38391 L
DX 37979,Y DEX JMP 38391   PK
•2146 DATA 173,48,148,208,4,232,76,247,14
9,190,91,148,202,76,247,149   OB
•2159 REM   *** DOWNMOVE SUBROUTINE ***   PI
•2160 XB=38592:XE=38625:GOSUB 20   CJ
•2161 REM GET VERT.LOC.,INCREMENT,CHECK E
DGE,STORE NEW VERT.LOC.   FD
•2162 REM LDX 53249,Y INX TXA CMP 37979,Y
 BNE+3 JSR 38610 TXA STA 53249,Y RTS   FK
•2163 DATA 190,1,208,232,138,217,91,148,2
08,3,32,210,150,138,153,1,208,96   NF
•2164 REM * BOTTOMCHECK   PG
•2165 REM LDA 37936 BNE+4 DEX JMP 38391 L
DX 37978,Y INX JMP 38391   HD
•2166 DATA 173,48,148,208,4,202,76,247,14
9,190,90,148,232,76,247,149   OM
•2179 REM *** LEFTMOVE (HI BIT SET) ***   KO
•2180 XB=38656:XE=38669:GOSUB 20   GC
•2181 REM GET HORIZ LOC, DECREMENT, CHECK
 CROSSOVER, STORE AND RETURN   DJ
•2182 REM LDX 53248,Y DEX BPL+3 JSR 38324
 TXA STA 53248,7 RTS   IE
•2183 DATA 190,0,208,202,16,3,32,180,149,
138,153,0,208,96   DC
•2199 REM *** LEFTMOVE (HI BIT CLR) ***   KJ
•2200 XB=38720:XE=38756:GOSUB 20   LH
•2201 REM GET HORIZONTAL POSITION, DECREM
ENT; IF EDGE, MOVE AND LEAVE   BC
•2202 REM LDX 53248,Y DEX TXA CMP 37994,Y
 BNE+3 JSR 38738 TXA STA 53248,Y RTS   OC
•2203 DATA 190,0,208,202,138,217,106,148,
208,3,32,82,151,138,153,0,208,96   FL
•2204 REM *** LEFT CHECK   IA
•2205 REM LDA 37936 BNE+4 INX JMP 38391 L
DX 37995,Y DEX JSR 38314 JMP 38391   BE
•2206 DATA 173,48,148,208,4,232,76,247,14
9,190,107,148,202,32,170,149,76,247,149  PA
•2219 REM *** RIGHTMVE (HI BIT SET) ***   CM
•2220 XB=38784:XE=38820:GOSUB 20   CL
•2221 REM GET HORIZONTAL POSITION, INCREM
ENT; IF EDGE, MOVE AND LEAVE   DI
•2222 REM LDX 53248,Y INX TXA CMP 37932,Y
 BNE+3 JSR 38802 TXA STA 53248,Y RTS   EM
•2223 DATA 190,0,208,232,138,217,107,148,
208,3,32,146,151,138,153,0,208,96   BE
•2224 REM *** RIGHT CHECK   OB
•2225 REM LDA 37936 BNE+4 DEX JMP 38391 L
DX 37994,Y INX JSR 38324 JMP 38391   DG
•2226 DATA 173,48,148,208,4,202,76,247,14
9,190,106,148,232,32,180,149,76,247,149  MI
•2239 REM *** RIGHTMVE (HI BIT CLR) ***   LP
•2240 XB=38848:XE=38861:GOSUB 20   CL
•2241 REM GET HORIZ LOC, INCREMENT, CHECK
 CROSSOVER, STORE AND RETURN   ND
•2242 REM LDX 53248,Y INX BNE+3 JSR 38314
 TXA STA 53248,Y RTS   DI
•2243 DATA 190,0,208,232,208,3,32,170,149
,138,153,0,208,96   ND
•2399 REM *** BASIC MOVEMENT HANDLER ***   AN
•2400 XB=38336:XE=38346:GOSUB 20   BL
•2401 REM SET Y TO OFFSET OF SELECTED SPR
ITE   DD
•2402 REM LDY#59 LDA(45)Y TAX LDY 37944,X
 JMP 38400   AF
•2403 DATA 160,59,177,45,170,188,56,148,7
6,0,150   OI
•2469 REM ** REPORT NON-SPRITE-0 WRAPS AN
D EDGES TO BASIC   PI
•2470 XB=38391:XE=38399:GOSUB 20   EC
•2471 REM WAS IT SPRITE 0? IF NOT, REPORT
 WRAP   OF
•2472 REM CPY#0 BNE+1 RTS STY 37943 RTS   OL
•2473 DATA 192,0,208,1,96,140,55,148,96   OO
•2499 REM   *** READ JOYSTICK ***   BO
•2500 XB=38912:XE=38972:GOSUB 20   FC
•2501 REM SET READ VECTOR TO POINT TO JOY
STICK ROUTINE   MO
•2502 X=38912:POKE 37890,FN LO(X):POKE 37
891,FN PG(X):REM (REM THIS TO USE KEYB.) DC
•2506 REM GET JOYSTICK 2; STORE IT, CHECK
 FOR FIREBUTTON, REPORT IF PRESSED   ON
•2507 REM LDA 56320 STA 37933 AND#16 BNE+
8 LDA#1 STA 37927 JSR 39168   JH
•2508 DATA 173,0,220,141,45,148,41,16,208
,8,169,1,141,39,148,32,0,153   AD
•2509 REM IS MOVEMENT CALLED FOR? IF SO,
SET JOYDIR, SET SHAPE 0   AC
•2510 REM LDA 37933 AND#15 CMP#15 BNE+3 J
MP(37900) EOR#15 STA 37963 JSR 39040   LK
•2511 DATA 173,45,148,41,15,201,15,208,3,
108,12,148,73,15,141,75,148,32,128,152   AN
•2512 REM MOVE ONCE, THEN POINT MOVE.VECT
.TO MOVEMENT HANDLER   HN
•2513 REM LDY#0 JSR 38400 JSR 39072 LDA 3
7892 STA 37898   OG
•2514 DATA 160,0,32,0,150,32,160,152,173,
4,148,141,10,148   OM
•2515 REM LDA 37893 STA 37899 JMP(37900)  MK
•2516 DATA 173,5,148,141,11,148,108,12,14
8   EH
•2529 REM *** INTERR.MOVE.HANDLER ***   PG
•2530 XB=38976:XE=39009:GOSUB 20   PM
•2531 POKE 37892,FN LO(XB):POKE 37893,FN
PG(XB)   IF
•2532 REM SET UP FOR SPRITE 0, GO MOVE, C
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HECK COLLISIONS, REDO IF NECESSARY      DP
•2533 REM LDY#0 JSR 38400 JSR 39072     KH
•2534 DATA 160,0,32,0,150,32,160,152    BJ
•2535 REM DO IT AGAIN? IF NOT, RESET TIME
R                                       NP
•2536 REM DEC 37928 BNE-13 LDA 37926 STA
37928                                   LI
•2537 DATA 206,40,148,208,243,173,38,148,
141,40,148                              LH
•2538 REM RESET MOVEMENT VECTOR, QUIT   FF
•2539 REM LDA 37896 STA 37898 LDA 37897 S
TA 37899 JMP(37900)                     NJ
•2540 DATA 173,8,148,141,10,148,173,9,148
,141,11,148,108,12,148                  FG
•2549 REM *** SET SHAPE 0 ***           DB
•2550 XB=39040:XE=39057:GOSUB 20        BC
•2551 REM USING JOYDIR AS INDEX, GET SPRI
TE SHAPE CODE FROM SPRITE 0 DIREC.TABLE CA
•2552 REM LDA 37923 BNE+9 LDY 37963 LDA 3
7951,Y STA 33784 JSR 39232 RTS          MA
•2553 DATA 173,35,148,208,9,172,75,148,18
5,63,148,141,248,131,32,64,153,96       FI
•2569 REM ** SPRITE 0 COLLISION ROUTINE AM
•2570 XB=39072:XE=39111:GOSUB 20        DC
•2571 REM DO WE BOUNCE OFF SPRITES? IF SO
, DO IT                                 DG
•2572 REM LDA 37940 BEQ+16 LDA 53278 STA
37929 AND#1 BEQ+6                       CH
•2573 DATA 173,52,148,240,16,173,30,208,1
41,41,148,41,1,240,6                    LG
•2574 REM JSR 39248 JMP UNMOVE          GD
•2575 DATA 32,80,153,76,208,152         FI
•2576 REM DO WE BOUNCE OFF FOREGROUND? IF
 SO, DO IT AND RETURN                   FK
•2577 REM LDA 37941 BEQ+13 LDA 53279 AND#
1 BEQ+6 JSR 39280 JMP UNMOVE RTS        CP
•2578 DATA 173,53,148,240,13,173,31,208,4
1,1,240,3,32,112,153,76,208,152,96      CD
•2579 REM ** UNMOVE **                  AI
•2580 XB=39120:XE=39148:GOSUB 20        PK
•2581 REM STOP GOSPEED, REVERSE JOYDIR AN
D STORE IT                              AN
•2582 REM LDA#1 STA 37928 LDY 37963 LDA 3
8009,Y STA 37963                        KH
•2583 DATA 169,1,141,40,148,172,75,148,18
5,121,148,141,75,148                    OB
•2584 REM GO MOVE, REVERSE JOYDIR AND RES
TORE IT, QUIT                           KE
•2585 REM LDY#0 JSR 38400 LDY 37963 LDA 3
8009,Y STA 37963 RTS                    IO
•2586 DATA 160,0,32,0,150,172,75,148,185,
121,148,141,75,148,96                   OC
•2599 REM    *** READ KEYBOARD ***      MN
•2600 REM XB=00000:XE=00000:GOSUB 20    KC
•2601 REM SET READ VECTOR TO POINT TO KEY
BOARD ROUTINE (REMOVE REM TO USE)       LE
•2602 REM X=38912:POKE 37890,FN LO(X):POK
E 37891,FN PG(X):REM (NOT IN FORCE)     PF
•2699 REM ** BASIC VARIABLE SUBROUTINES DD
•2700 XB=39168:XE=39174:GOSUB 20        KD
•2701 REM ** REPORT FIREBUTTON - C0%    LD
•2702 REM LDY#10 LDA#1 STA(45),Y RTS    EA
•2703 DATA 160,10,169,1,145,45,96       PP
•2709 REM ** REPORT SPRITES TO BASIC    PN
•2710 XB=39184:XE=39222:GOSUB 20        CJ
•2711 REM C1%=EDGEWRAP, C2%=S/S COLLIS. JP
•2712 REM LDY#17 LDA 37943 BEQ+2 STA(45)Y
 LDY#24 LDA 37937 BEQ+2 STA(45)Y        BB
•2713 DATA 160,17,173,55,148,240,2,145,45
,160,24,173,49,148,240,2,145,45         LI
•2714 REM C3%=S/FOREG.COLLIS.,ERASE,RET. KM
•2715 REM  LDY#31 LDA 37938 BEQ+2 STA(45)
Y                                       AD
•2716 DATA  160,31,173,50,148,240,2,145,4
5                                       CL
•2717 REM LDA#0 STA 37937 STA 37938 STA 3
7943 RTS                                EP
•2718 DATA 169,0,141,49,148,141,50,148,14
1,55,148,96                             KJ
•2719 REM ** REPORT MOVEMENT            BK
•2720 XB=39232:XE=39241:GOSUB 20        BC
•2721 REM C4%=PLAYER HAS TRIED TO MOVE  GH
•2722 REM LDY#38 LDA#1 STA(45)Y STA 37935
 RTS                                    PN
•2723 DATA 160,38,169,1,145,45,141,47,148
,96                                     NK
•2729 REM ** REPORT SPRITE 0 BOUNCE/S   MP
•2730 XB=39248:XE=39257:GOSUB 20        AC
•2731 REM C5%=SPRITE 0 BOUNCED/SPRITE:  CD
•2732 REM LDY#45 LDA 37929 AND#254 STA(45
)Y RTS                                  AI
•2733 DATA 160,45,173,41,148,41,254,145,4
5,96                                    DH
•2739 REM ** REPORT SPRITE 0 BOUNCE/F   MA
•2740 XB=39280:XE=39289:GOSUB 20        CF
•2741 REM C6%=SPRITE 0 BOUNCED FOREGROU. PH
•2742 REM LDY#52 LDA#1 STA(45)Y STA 37930
 RTS                                    KM
•2743 DATA 160,52,169,1,145,45,141,42,148
,96                                     LP
•2898 REM    *** WRAPUP ***             HC
•2899 REM ALL ROUTINES EXIT THROUGH HERE AJ
•2900 XB=40704:XE=40721:GOSUB 20        MD
•2901 REM ** SET COLLISION VECTOR       FI
•2902 X=40704:POKE 37900,FN LO(X):POKE 37
901,FN PG(X)                            HB
•2906 REM GET COLLISION DATA AND REPORT I
T TO BASIC VARIABLES                    DG
•2907 REM LDA 53278 STA 37937 LDA 53279 S
TA 37938 JSR 39184                      IJ
•2908 DATA 173,30,208,141,49,148,173,31,2
08,141,50,148,32,16,153                 ED
•2915 REM RETURN TO HOUSEKEEPING        EL
•2916 REM JMP(37888)                    MI
•2917 DATA 108,0,148                    FH
•2989 REM ROUTINES ADDED BEFORE FINAL JMP
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() WILL EXECUTE EVERY INTERR.                  MF
•2998 REM  *** SET UP SPRITE SHAPES ***        BK
•2999 REM ** PLANETS                           AK
•3000 FOR I=34304 TO 34816 STEP 512:FOR J
 =0 TO 448 STEP 64:FOR K=0 TO 20               AJ
•3001 READ A:POKE I+J+K,A:NEXT                 AO
•3002 FOR K=21 TO 63:POKE I+J+K,0:NEXT:NE
 XT:GOSUB 3985:NEXT                            FF
•3009 REM ** PLANET 1 SHAPE DATA               HM
•3010 DATA 0,40,0,0,175,0,82,191,192,82,1
 75,128,2,191,128,0,171,0,0,40,0               DC
•3011 DATA 0,40,0,0,190,0,2,255,128,5,190
 ,128,5,254,128,0,175,0,0,40,0                 IL
•3012 DATA 0,40,0,0,250,0,3,254,128,2,90,
 128,3,90,128,0,190,0,0,40,0                   DM
•3013 DATA 0,40,0,0,234,0,3,250,128,3,229
 ,128,3,229,128,0,250,0,0,40,0                 HF
•3014 DATA 0,40,0,0,170,0,3,234,80,3,170,
 80,3,170,128,0,234,0,0,40,0                   JN
•3015 DATA 0,40,0,0,170,20,3,170,212,2,17
 0,128,2,170,192,0,170,0,0,40,0                CA
•3016 DATA 0,40,0,0,170,64,2,171,192,2,17
 0,192,2,171,192,0,170,0,0,40,0                NH
•3017 DATA 0,40,0,5,171,0,6,175,192,2,171
 ,192,2,175,192,0,170,0,0,40,0                 JJ
•3019 REM ** PLANET 2 SHAPE DATA               GP
•3020 DATA 0,40,0,3,170,192,62,170,148,16
 2,170,143,42,255,252,2,255,192,0,40,0         JC
•3021 DATA 0,40,0,3,106,192,61,106,188,24
 1,106,143,62,171,252,2,171,192,0,40,0         LA
•3022 DATA 0,24,0,3,90,192,61,90,188,81,9
 0,143,63,234,188,3,234,128,0,24,0             EL
•3023 DATA 0,20,0,3,86,192,61,86,188,241,
 86,138,61,255,168,1,255,128,0,20,0            OP
•3024 DATA 0,20,0,3,85,128,61,85,104,241,
 85,74,63,223,252,3,223,192,0,20,0             DG
•3025 DATA 0,20,0,3,149,192,62,149,124,24
 2,149,79,63,253,252,3,253,192,0,20,0          ML
•3026 DATA 0,40,0,2,169,192,62,169,124,24
 2,169,79,63,255,252,3,255,192,0,40,0          JI
•3027 DATA 0,40,0,2,170,0,42,170,188,162,
 170,143,63,255,212,3,255,192,0,40,0           KO
•3058 GOSUB 3985                               GI
•3059 REM ** SPRITE ANIMATION TABLES           DM
•3060 FOR I=38088 TO 38112 STEP 8:FOR J=0
 TO 7:READ A:POKE I+J,A:NEXT:NEXT              MI
•3061 REM ** ANIMATION TABLE DATA              DN
•3062 DATA 24,25,26,27,28,29,30,31             EO
•3063 DATA 32,33,34,35,36,37,38,39             EO
•3064 DATA 27,26,25,24,31,30,29,28             OO
•3065 DATA 37,36,35,34,33,32,39,38             BG
•3098 REM     ***    SPRITE 0 SHAPES    ***    IL
•3099 REM ** SPRITE 0 DIRECTION TABLE          KK
•3100 FOR I=37952 TO 37961:READ A:POKE I,
 A:NEXT:GOSUB 3985                             PH
•3101 DATA 16,20,0,22,23,21,0,18,17,19         HA
•3102 REM ** SPRITE 0 ANIMATION TABLE          PB
•3103 FOR I=0 TO 7:POKE 38080+I,16+I:NEXT      PC
•3104 REM ** SPRITE 0 SHAPES                   KN
•3105 FOR I=33792 TO 34240 STEP 64:FOR J=
 0 TO 18 STEP 3                                AD
•3106 READ A:POKE I+J,A:POKE I+J+1,0:POKE
 I+J+2,0:NEXT                                  AM
•3107 FOR J=21 TO 63:POKE I+J,0:NEXT:NEXT
 :GOSUB 3985                                   GL
•3109 REM ** SPRITE 0 DATA                     BM
•3110 DATA 8,28,28,28,54,34,0                  EI
•3111 DATA 6,14,28,120,240,48,32               KA
•3112 DATA 0,224,62,31,62,224,0                KN
•3113 DATA 32,48,240,120,28,14,6               OO
•3114 DATA 0,34,54,28,28,28,8                  PK
•3115 DATA 4,12,15,30,56,112,96                LB
•3116 DATA 0,7,124,248,124,7,0                 BK
•3117 DATA 96,112,56,30,15,12,4                GB
•3298 REM ** SPRITE MOVEMENT DATA              GL
•3299 REM ** LOCATION REGISTER OFFSET TAB
 LE                                            AG
•3300 X=0:FOR I=37944 TO 37951:POKE I,X:X
 =X+2:NEXT                                     AH
•3304 REM ** SPRITE BITMASK TABLE              DL
•3305 X=1:FOR I=37962 TO 37976 STEP 2:POK
 E I,X:X=X*2:NEXT                              OD
•3307 REM ** SPRITE JOYDIR TABLE               BI
•3308 REM SPRITE DIRECTIONS: 1=UP 2=DN 4=
 LF 8=RT  ADD FOR DIAGONALS                    OE
•3309 REM 0=NO MOVEMENT (CAN BE CHANGED F
 ROM BASIC)                                    KN
•3310 FOR I=37963 TO 37977 STEP 2:READ A:
 POKE I,A:NEXT                                 OL
•3311 DATA 0,5,6,10,9,0,0,0                    MA
•3312 REM ** SPRITE BORDERS TABLE **           LC
•3313 REM EACH SPRITE'S SCREEN MARGINS AR
 E INDIVIDUALLY SET                            CD
•3314 REM SPRITES ARE CONSIDERED IN NUMER
 ICAL ORDER                                    NC
•3315 REM ** TOP EDGES (0-7)                   CI
•3316 FOR I=37978 TO 37992 STEP 2:READ A:
 POKE I,A:NEXT                                 LO
•3317 DATA 50,43,43,43,43,43,43,43             PI
•3318 REM ** BOTTOM EDGES (0-7)                PM
•3319 FOR I=37979 TO 37993 STEP 2:READ A:
 POKE I,A:NEXT                                 GK
•3320 DATA 243,250,250,250,250,250,250,25
 0                                             JK
•3321 REM ** LEFT EDGES (0-7)                  JJ
•3322 FOR I=37994 TO 38008 STEP 2:READ A:
 POKE I,A:NEXT                                 ID
•3323 DATA 23,0,0,0,0,0,0,0                    IA
•3324 REM ** RIGHT EDGES (0-7)                 LI
•3325 FOR I=37995 TO 38009 STEP 2:READ A:
 POKE I,A:NEXT                                 JD
•3326 DATA 80,87,87,87,87,87,87,87             IL
•3327 REM ** JOYSTICK REVERSAL TABLE           CG
•3328 FOR I=38010 TO 38019:READ A:POKE I,
 A:NEXT                                        FD
•3329 DATA 2,1,0,8,10,9,0,4,6,5                LB
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 121 and 122 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
·3985 PRINT "[RVSON]![RVSOFF]";              NG
·3990 RETURN                                 IM
```

SLITHER

FROM PAGE 35

```
·1 REM ALL TIME HIGH 43,840                  JO
·10 POKE53281,0:POKE53280,0:POKE52,56:POK
 E56,56:I=RND(-TI):PRINTCHR$(142)            HP
·20 J0=127:J2=56320:S=1024:SI=54272:C=SI:
 S1=SI+1:S4=SI+4:S5=SI+5:S6=SI+6:SV=SI+24    PK
·22 BH=33:BS=34:BC=32:NS=40:C$=CHR$(96)      HE
·30 FORI=SITOSV:POKEI,0:NEXT:POKES6,242:P
 OKESV,15                                    IP
·32 POKE56334,0:POKE1,51                     KE
·34 A=14336:B=53248:FORI=0TO1487:POKEI+A,
 PEEK(I+B):NEXT                              HC
·36 POKE1,55:POKE56334,1:POKE53272,30        PP
·38 FORI=0TO30:READP:POKE49152+I,P:NEXT      AG
·40 FORI=14600TO14631:READP:POKEI,P:NEXT     IE
·42 FORI=15064TO15159:READP:POKEI,P:NEXT     KH
·44 FORI=14720TO14799:READP:POKEI,P:NEXT     OA
·60 DIMJD(32),L$(NS),FC(12),FS(13),BC(5)     IE
·64 JD(1)=-40:JD(2)=40:JD(4)=-1:JD(8)=1      KO
·66 FORJ=1TONS:READL$(J):NEXT                EC
·68 FORI=1TO12:READFC(I):NEXT                JN
·70 FORI=1TO13:READFS(I):NEXT                IO
·72 FORI=1TO5:READCB(I):NEXT                 DJ
·99 :                                        DI
·100 PRINT"[CLEAR][6"[DOWN]"]"               NG
·120 PRINT"[PURPLE]  [5"[s C]"] [s C][5"
 "][s C] [5"[s C]"] [s C][3" "][s C] [5"[
 s C]"] [4"[s C]"] "                         EH
·122 PRINT"[BLUE]  [s C][5" "][s C][5" "]
 [s C][3" "][s C][3" "][s C][3" "][s C] [
 s C][5" "][s C][3" "][s C]"                 DN
·124 PRINT"[c 7][3" "][3"[s C]"]  [s C][5
 " "][s C][3" "][s C][3" "][5"[s C]"] [4"
 [s C]"]  [4"[s C]"]"                        KN
·126 PRINT"[CYAN][6" "][s C] [s C][5" "][
 s C][3" "][s C][3" "][s C][3" "][s C] [s
 C][5" "][s C]  [s C]"                       HE
·127 PRINT"[GREEN]  [4"[s C]"]  [5"[s C]"
 ] [s C][3" "][s C][3" "][s C][3" "][s C]
 [5"[s C]"] [s C][3" "][s C]"                CK
·130 FORI=1TO200:NEXT                        KN
·132 PRINT"[HOME][4"[DOWN]"][WHITE]"TAB(1
 2)"DIFFICULTY 12345":P=S+183                OB
·134 J=PEEK(J2):IFJ=119THENP=P+1:IFP>S+18
 7THENP=P-1                                  PG
·136 IFJ=123THENP=P-1:IFP<S+183THENP=P+1     DM
·138 IFJ=111THEN160                          FE
·140 POKEP,PEEK(P)OR128:FORI=1TO30:NEXT:P
 OKEP,PEEK(P)AND127:GOTO134                  HJ
·160 DI=P-(S+182):DU=DI:W=7:SC=0:L=1         IJ
·162 POKE53270,216:POKE53282,6:POKE53283,
 5                                           GO
·190 GOSUB700                                CH
·192 P=S+165:PD=1                            GN
·199 :                                       DI
·200 J=PEEK(J2):IFJ=J0THEN250                BC
·202 J=J0-J:IFJD(J)THENPD=JD(J)              DH
·250 Q=PEEK(P+PD):IFQ<>BCTHEN300             EK
·252 POKEP,BS:P=P+PD:POKEP+C,CB:POKEP,BH     CK
·260 FORD=1TO50:NEXT:GOTO200                 MO
·298 :                                       DI
·299 : * COLLISION *                         FP
·300 IFQ<91THEN400                           DI
·302 Q=Q-90:SC=SC+FS(Q):POKEP,BS:FORI=Q*1
 2+10TO0STEP-Q/2:POKES1,I:POKES4,17:NEXT     IK
·304 P=P+PD:POKEP,BH:FORI=0TOQ*12+10STEPQ
 /2:POKES1,I:POKES4,17:NEXT:POKES4,16        BB
·310 POKEP+C,CB:GOSUB350:DU=DU-1:IFDU=0TH
 EN800                                       LN
·312 GOTO200                                 BO
·348 :                                       DI
·349 : * STATUS LINE *                       JC
·350 PRINT"[HOME][WHITE]SCORE  ";:N=SC:GO
 TO940                                       BB
·360 PRINT"[HOME]"TAB(19)"[BLUE]("CHR$(48
 +W)")"TAB(28)"[GREEN]HIGH  ";:N=SH:GOSUB
 940                                         MC
·362 PRINT"[WHITE]":RETURN                   KJ
·398 :                                       DI
·399 : * CRASHED *                           JA
·400 POKES1,5:POKES4,129:FORI=15TO0STEP-1
 :POKESV,I:POKEP+C,I:POKE53281,I             OO
·402 POKE53280,I:POKE53282,15-I:POKE53283
 ,I:FORJ=1TO20:NEXT:NEXT                     OG
·406 POKE53282,6:POKE53283,5:POKESV,15:PO
 KES4,0:W=W-1:GOSUB360:IFW=0THEN410          CK
·408 POKEP,BC:SYS49152:FORI=1TO800:NEXT:G
 OTO192                                      LG
·410 PRINT"[HOME][11"[DOWN]"]":PRINTTAB(1
 5)"GAME  OVER"                              BO
·412 IFSC>SHTHENSH=SC:GOSUB450               FB
·420 PRINTTAB(7)"[WHITE]PRESS [RED]BUTTON
 [WHITE] TO PLAY AGAIN":GOSUB360             MK
·430 IFPEEK(J2)<>111THEN430                  IA
·440 GOSUB3100:GOTO130                       LK
·450 FORJ=1TO15:PRINTTAB(15)"[UP][RVSON][
 RED]HIGH SCORE":FORI=1TO20:NEXT:POKES1,3
 8:POKES4,33                                 FJ
·452 PRINTTAB(15)"[UP][YELLOW]HIGH SCORE"
 :FORI=1TO20:NEXT:POKES1,40:POKES4,33:NEX
 T                                           ON
·454 POKES4,32:RETURN                        HI
·598 :                                       DI
·599 : * PLACE PRIZES *                      NC
·600 R=INT(RND(1)*19)*40+INT(RND(1)*36)+1
 22+S:IFPEEK(R)<>BCORR=S+165THEN600          LE
```

```
•610 L1=L:IFL>12THENL1=12                          PI
•620 POKER,L1+90:POKER+C,FC(L1):RETURN             DO
•698 :                                             DI
•699 : * SET UP SCREEN *                           PF
•700 IFL=1THENGOSUB900                             KD
•701 PRINT"[CLEAR][DOWN][DOWN][c 8][40"$"
 ]";                                               GD
•702 FORI=1TO21:PRINT"$[38" "]$";:NEXT             GE
•704 PRINT"[39"$"]";:POKE2023,36:POKE5629
 5,15                                              PN
•705 L1=L:IFL>12THENL1=12                          PI
•706 PRINT"[HOME][DOWN][WHITE]"TAB(17-LEN
 (L$(L))/2)"#"MID$(STR$(L),2)"-"L$(L)" ";          IF
•707 POKE646,FC(L1):PRINTCHR$(L1+218)              DN
•710 READA,B:IFA=0THEN720                          FK
•711 N=1:IFB-A>39THENN=40                          GF
•712 FORI=A+STOB+SSTEPN:POKEI,36:POKEI+C,
 15:NEXT:GOTO710                                   OH
•720 FORJ=1TODU:GOSUB600:NEXT:GOSUB350:GO
 SUB360:CB=CB(DI):FORI=1TO400:NEXT                 PA
•732 RETURN                                        IM
•798 :                                             DI
•799 : * COMPLETED A SCREEN *                      KN
•800 DU=DI:FORI=1TO200:NEXT:L1=L:IFL>12TH
 ENL1=12                                           CA
•810 PRINT"[HOME][10"[DOWN]"]"                     JL
•812 PRINTTAB(15)"BONUS  [RED]"RIGHT$("
 "+STR$(FS(L1+1)),3)                               EM
•814 SC=SC+FS(L1+1):GOSUB350:FORI=1TO800:
 NEXT:L=L+1:IFL<=NSTHEN190                         PC
•820 K=0:L=1:GOSUB3100:PRINT"[CLEAR]":POK
 ES6,240                                           LH
•822 A=80:B=960:N=40:GOSUB960:A=961:B=999
 :N=1:GOSUB960:A=959:B=119:N=-40:GOSUB960          LO
•824 A=118:B=81:N=-1:GOSUB960                      KH
•830 GOSUB350:GOSUB360:M=0:A$="LEVEL"+C$+
 CHR$(DI+112)+C$+C$+"BONUS"                        JP
•832 POKES6,251:FORJ=1TO14:POKES1,J+70:PO
 KES4,21:POKES4,20                                 JI
•834 FORI=1196TO1476STEP40:POKEI+J-40,32:
 POKEI+J,ASC(MID$(A$,J,1))-64:NEXT:NEXT            OO
•836 FORI=1TO800:NEXT:POKES6,242:FORI=1TO
 12:POKEI+1597,I+90:POKEI+55869,FC(I)              AH
•838 POKES1,I+5:POKES4,129:FORJ=1TO10:NEX
 T:M=M+FS(I)*DI:POKES4,128                         LL
•840 FORJ=1TO20:NEXT:PRINT"[HOME][RED][12
 "[DOWN]"]"TAB(18)RIGHT$("[3" "]"+STR$(M)
 ,4)                                               HG
•842 SC=SC+FS(I)*DI:GOSUB350:NEXT:DI=DI+1
 :DU=DU+1:IFDI>5THENDI=5:DU=5                      PA
•854 FORI=1TO200:NEXT:PRINT"[5"[DOWN]"]"T
 AB(12)DI"[BLUE] BONUS LIVES":W=W+DI:IFW>
 9THENW=9                                          JL
•860 GOSUB360:PRINT"[DOWN]"TAB(7)"[WHITE]
 GET READY FOR DIFFICULTY[RED]"DI                  PA
•870 FORI=1TO2000:NEXT:GOTO190                     EP
•899 :                                             DI
•900 PRINT"[CLEAR][8"[DOWN]"][RED]"TAB(9)
 NS"[WHITE]SCREENS THIS LEVEL":POKES6,252
 :POKES1,75                                        FA
•902 POKES1+14,DI*15+30:POKES4,21:POKES4,
 20:FORI=1TO2300:NEXT:POKES6,242:RETURN            IK
•940 PRINTRIGHT$("[5" "]"+STR$(N),6);:RET
 URN                                               DO
•960 FORI=A+STOB+SSTEPN:POKEI,42:POKEI+C,
 2+K:K=NOTK:POKES1,5+K:POKES4,129                  NK
•962 FORJ=1TO4:NEXT:POKES4,128:FORJ=1TO2:
 NEXT:NEXT:RETURN                                  ND
•998 :                                             DI
•999 : * ML DATA *                                 CC
•1000 DATA169,0,133,253,169,4,133,254,160
 ,0,162,4                                          CD
•1002 DATA177,253,201,34,208,4,169,32,145
 ,253,200,208,243,230,254,202,208,238,96           ML
•1099 : * CHARACTER DATA *                         BI
•1100 DATA40,158,158,190,190,158,158,40            BH
•1102 DATA40,190,190,190,190,190,190,40            MH
•1104 DATA36,254,36,36,36,254,36,0                 DO
•1106 DATA85,85,85,85,85,85,85,85                  CO
•1119 :                                            DI
•1120 DATA130,40,60,255,255,60,60,0                DF
•1122 DATA130,40,255,255,255,60,60,0               LK
•1124 DATA0,0,56,124,254,124,56,0                  GD
•1126 DATA60,40,170,190,170,190,170,40             FJ
•1128 DATA160,160,60,247,255,255,60,0              EF
•1130 DATA3,3,7,14,14,28,56,96                     HK
•1132 DATA60,60,60,60,60,60,247,247                BJ
•1134 DATA60,60,60,60,60,60,247,247                BJ
•1136 DATA28,193,3,1,3,1,3,1                       CD
•1138 DATA20,20,60,195,195,195,60,0                FC
•1140 DATA20,20,60,195,195,195,60,0                FC
•1142 DATA0,56,131,194,131,194,44,0                LE
•1159 :                                            DI
•1160 DATA254,198,198,198,198,198,254,0            GD
•1162 DATA6,6,6,6,6,6,6,0                          FA
•1164 DATA254,6,6,254,192,192,254,0                JG
•1166 DATA254,6,6,254,6,6,254,0                    IG
•1168 DATA198,198,198,254,6,6,6,0                  LN
•1170 DATA254,192,192,254,6,6,254,0                AC
•1172 DATA192,192,192,254,198,198,254,0            EB
•1174 DATA254,6,6,6,6,6,6,0                        NA
•1176 DATA254,198,198,254,198,198,254,0            PK
•1178 DATA254,198,198,254,6,6,6,0                  CC
•1199 : * NAMES *                                  AP
•1201 DATA"THE COURTYARD"                          JN
•1202 DATA"THE GATEHOUSE"                          HP
•1203 DATA"THE BARRACKS"                           DN
•1204 DATA"THE GARDEN"                             HE
•1205 DATA"THE CHAPEL"                             HI
•1206 DATA"THE PIT"                                KC
•1207 DATA"GALLERY I"                              DO
•1208 DATA"THE LIBRARY"                            OI
•1209 DATA"THE SNAKE"                              CI
•1210 DATA"THE COLONADE"                           BH
•1211 DATA"THE WINE CELLAR"                        KM
•1212 DATA"THE THREE ROOMS"                        DI
```

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•1213 DATA"THE DOUBLE-E ROOM"          AH
•1214 DATA"GALLERY II"                 IO
•1215 DATA"THE OVAL ROOM"              EC
•1216 DATA"THE GREENHOUSE"             LM
•1217 DATA"THE MESH ROOM"              FP
•1218 DATA"THE PRISON"                 MC
•1219 DATA"THE I-J-K ROOM"             ID
•1220 DATA"THE CUBICLES"               CK
•1221 DATA"TRIPLE-T"                   AD
•1222 DATA"THE VESTIBULE"              JB
•1223 DATA"THE ARENA"                  DN
•1224 DATA"DEATHTRAP I"                OO
•1225 DATA"THE S-CHAMBER"              DE
•1226 DATA"THE SPIRAL HALL"            OO
•1227 DATA"THE WEB"                    KJ
•1228 DATA"THE MAZE"                   PB
•1229 DATA"THE PIT II"                 GL
•1230 DATA"THE ATRIUM"                 LB
•1231 DATA"THE CLOAKROOMS"             MF
•1232 DATA"THE DUNGEON"                OB
•1233 DATA"THE SHIFTING HALL"          GO
•1234 DATA"THE SUITE"                  GG
•1235 DATA"THE PANTRY"                 LP
•1236 DATA"GALLERY [3"I"]"             NN
•1237 DATA"THE WINDBREAK"              FL
•1238 DATA"DEATHTRAP II"               CE
•1239 DATA"THE WALL"                   PC
•1240 DATA"DEATHTRAP [3"I"]"           JB
•2999 : * MISCELLANEOUS *              IH
•3010 DATA10,12,7,15,10,7,9,15,9,9,15,10 FJ
•3020 DATA10,25,50,75,100,125,150,175,200
,250,300,400,500                       AI
•3030 DATA15,10,12,14,13               AL
•3099 : * COORDINATE DATA *            IG
•3100 POKE65,PEEK(61):POKE66,PEEK(62):RET
URN                                    GI
•3110 DATA0,0                          BC
•3120 DATA135,455,495,498,145,465,502,505
,0,0                                   AG
•3130 DATA139,379,140,380,410,429,650,669
,699,939,700,940,0,0                   PP
•3140 DATA401,420,659,678,0,0          EO
•3150 DATA330,730,350,750,521,536,543,558
,0,0                                   FO
•3160 DATA250,269,250,810,269,829,811,816
,822,828,455,458,461,464,455,655       JD
•3162 DATA504,664,656,663,0,0          PF
•3170 DATA130,410,650,930,149,429,669,949
,339,739,340,740,0,0                   KC
•3180 DATA287,767,312,792,290,309,410,429
,530,549,650,669,770,789,0,0           LM
•3190 DATA285,314,325,405,445,474,474,594
,605,634,645,725,765,794,0,0           LE
•3200 DATA446,606,250,450,610,930,454,614
,458,618,461,621,465,625,149,469       JI
•3202 DATA629,949,473,633,0,0          CP
•3210 DATA210,229,361,374,385,398,530,549
,681,694,705,718,850,869,0,0           CE
•3220 DATA415,424,521,530,549,558,570,650
,850,930,455,655,855,935,464,664       HP
•3222 DATA864,944,589,669,869,949,0,0  FF
•3230 DATA244,257,262,275,524,532,547,555
,804,817,822,835,297,777,302,782,0,0   KH
•3240 DATA241,250,254,265,269,278,418,421
,765,770,789,794,290,730,294,774       FI
•3242 DATA458,778,461,781,305,785,309,789
,0,0                                   IA
•3250 DATA378,381,415,417,422,424,453,454
,465,466,492,493,506,507,531,532       JF
•3252 DATA547,548,691,692,707,708,732,733 FK
•3254 DATA746,747,773,774,785,786,815,817
,822,824,858,861,0,0                   CF
•3260 DATA205,234,405,434,605,634,805,834
,245,785,0,0                           BN
•3270 DATA325,925,250,730,335,935,140,740
,345,945,150,750,355,955,0,0           EB
•3280 DATA130,410,650,930,149,429,669,949
,334,345,374,385,414,428               FF
•3282 DATA651,665,694,705,734,745,0,0  AE
•3290 DATA286,304,330,730,766,774,339,739
,777,779,344,784,545,546               LF
•3292 DATA312,312,351,351,390,390,429,429
,468,468,507,507,587,587,628,628,669,669 EA
•3294 DATA710,710,751,751,792,792,0,0  NI
•3300 DATA135,255,140,260,145,265,150,270
,155,275,805,925,810,930,815,935       OI
•3302 DATA820,940,825,945,830,950,835,955
,0,0                                   KO
•3310 DATA286,486,580,940,314,514,521,530
,535,545,550,558,0,0                   JB
•3320 DATA326,338,341,353,526,553,726,738
,741,753,141,301,366,406,646,686       GJ
•3322 DATA393,433,673,713,778,938,0,0  NE
•3330 DATA137,142,253,257,262,266,410,413
,426,429,610,613,626,629,773,777,782   PB
•3332 DATA786,897,902,177,217,182,222,450
,570,469,589,817,857,822,862,0,0       NM
•3340 DATA243,843,290,810,297,937,142,822
,309,829,316,876,248,257,267,276       KC
•3342 DATA843,852,862,871,0,0          KI
•3350 DATA241,263,416,423,576,583,736,743
,896,918,936,958,456,536,623,703,0,0   PN
•3360 DATA216,224,376,381,540,544,696,701
,860,864,145,865,416,936,0,0           PA
•3370 DATA325,725,136,456,616,936,347,747
,158,478,638,958,521,530,542,552       KD
•3372 DATA331,341,353,357,731,741,753,757
,0,0                                   HI
•3380 DATA404,412,427,435,452,932,140,820
,467,947,0,0                           AP
•3390 DATA410,416,423,429,655,668,821,824
,450,930,695,735,895,935,861,941       IP
•3392 DATA469,949,0,0                  JD
•3400 DATA321,329,335,337,342,344,350,358
,526,536,543,553,766,776,783,793       OO
•3402 DATA376,496,383,503,566,726,593,753
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 121 and 122 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
,816,936,823,943,0,0                        OB
•3410 DATA241,246,250,256,263,275,454,456
,463,465,614,616,623,625,804,829            LJ
•3412 DATA833,838,290,770,296,416,656,776
,303,423,663,783,309,789,0,0                GP
•3420 DATA244,275,284,315,655,664,695,704
,324,924,325,925,339,739,340,740            FO
•3422 DATA899,939,900,940,354,714,355,715
,0,0                                        FB
•3430 DATA361,376,384,398,681,696,704,718
,297,457,617,777,140,300,460,620            BJ
•3432 DATA780,940,303,463,623,783,0,0       NK
•3440 DATA408,413,648,653,425,431,665,671
,295,297,302,304,775,777,782,784            JK
•3442 DATA134,414,654,934,145,425,665,945
,0,0                                        CC
•3450 DATA325,925,330,930,335,935,145,745
,150,750,155,755,336,338,742,744,0,0        AE
•3460 DATA241,255,264,278,801,815,824,838
,288,528,535,775,259,819,260,820            AL
•3462 DATA311,551,544,784,0,0               IG
•3470 DATA565,925,490,850,415,775,340,700
,265,625,190,550,155,475,0,0                OA
•3480 DATA281,292,295,307,533,536,543,546
,772,784,787,798,332,652,812,932            MP
•3482 DATA339,419,340,420,659,739,660,740
,147,267,427,747,0,0                        HM
•3490 DATA523,556,0,0                       KC
•3500 DATA260,278,444,454,459,463,616,620
,625,635,801,819,135,615,464,944,0,0        FK
```

COMPULOAN

FROM PAGE 97

```
•10 PRINT "COPYRIGHT 1985 CHERYL PETERSON
"                                           EB
•15 PRINT"LOAN PAYMENT CALCULATOR"          GF
•20 PRINT"[RVSON]S[RVSOFF]CREEN DISPLAY O
R [RVSON]P[RVSOFF]RINTOUT?"                 KB
•30 GET S$:IF S$=""GOTO30                   CG
•35 IF S$="S" OR S$="P" THEN 40             MJ
•36 PRINT"WAS THAT AN [RVSON]S[RVSOFF] OR
 A [RVSON]P[RVSOFF]?":GOTO20                NO
•40 PRINT"VIEW/PRINT PAYBACK SCHEDULE ([R
VSON]Y[RVSOFF] OR [RVSON]N[RVSOFF])?"       MK
•50 GET V$:IF V$=""THEN50                   IM
•55 IF V$="Y" OR V$="N" THEN 210            CE
•60 PRINT"WAS THAT A [RVSON]Y[RVSOFF] OR
AN [RVSON]N[RVSOFF]?":GOTO50                MF
•210 INPUT"ENTER CASH VALUE BEING FINANCE
D";A                                        EP
•215 K=A:GOSUB 1000                         NI
•216 A=K                                    EH
•220 INPUT"ENTER NUMBER OF PAYMENTS PER Y
EAR";N                                      AK
•225 K=N:GOSUB 1000                         NN
•226 N=K                                    EI
•230 INPUT"ENTER TOTAL NUMBER OF PAYMENTS
 TO MAKE";T                                 KP
•235 K=T:GOSUB 1000                         NL
•236 T=K                                    FG
•240 INPUT"ENTER YEARLY INTEREST RATE";I    LN
•241 K=I:GOSUB 1000                         NA
•242 I=K                                    EP
•243 II=I:I=I/100                           GG
•250 IF S$="S"THEN 260                      IF
•251 OPEN1,4,7:CMD1                         KP
•260 PRINT CHR$(147)                        FG
•270 PRINT"LOAN PAYMENT CALCULATOR"         GF
•275 GOSUB 4030                             FO
•280 PRINT"AMOUNT FINANCED $";A$            AO
•285 PRINT"INTEREST RATE";II;"%."           AC
•290 PRINT"# OF PAYMENTS PER YEAR: ";N      NA
•300 PRINT"TOTAL NUMBER OF PAYMENTS IS ";
T                                           DE
•400 P=A*(I/N)/(1-(1/(1+(I/N))[UPARROW](T
)))                                         HO
•410 Z=P*T:C=Z-A                            NO
•600 GOSUB 3000                             FE
•610 PRINT"EACH PAYMENT IS";P$              PF
•620 PRINT"TOTAL INTEREST PAID IS $";C$     PP
•630 PRINT"TOTAL AMOUNT PAID IS $";Z$       IB
•640 PRINT                                  JJ
•690 IFV$<>"Y"THEN845                       DJ
•691 C=A*I/N                                DN
•695 J=P-C                                  DM
•697 A=A+C                                  CL
•700 IF S$="S" THEN 705                     JL
•701 PRINT SPC(7);"BALANCE";SPC(9);"PAYME
NT";SPC(8);                                 HP
•702 PRINT"INTEREST";SPC(7);"PRINCIPLE":G
OTO 710                                     JD
•705 PRINT" BALANCE";SPC(3);"PAYMENT";SPC
(2);"INTEREST";SPC(1);"PRINCIPLE"           JE
•710 X=1                                    DM
•720 GOSUB 3000                             FE
•725 GOSUB 4000                             FB
•730 IF X=50 AND X2<1THEN PRINT CHR$(12):
X=1:X2=X2+1:GOTO 700                        HK
•740 IF X2>0 AND X=60 THEN PRINT CHR$(12)
:X=1:GOTO 700                               ML
•750 IF LEN(A$)<=8 THEN A1=9-LEN(A$)        OE
•751 IF LEN(P$)<=8 THEN P1=9-LEN(P$)        AH
•752 IF LEN(C$)<=8 THEN C1=9-LEN(C$)        CG
•753 IF LEN(J$)<=8 THEN J1=9-LEN(J$)        BJ
•760 IF S$="S" THEN 765                     KJ
•761 PRINT SPC(A1+6);A$;SPC(P1+6);P$;SPC(
C1+6);C$;SPC(J1+6);J$:GOTO 770              ID
•765 PRINT SPC(A1);A$;SPC(P1);P$;SPC(C1);
C$;SPC(J1);J$                               CL
•770 A=A+C-P:C=A*I/N:J=P-C                  PC
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 121 and 122 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
·820 IF A+C<=P THEN P=A+C:J=A                NO
·825 IF A<=.01 THEN 845                      PL
·830 X=X+1                                   DJ
·840 GOTO 720                                CJ
·845 IF S$="S"THENEND                        HI
·850 PRINT#1:CLOSE 1:END                     ID
·999 END                                     IC
·1000 K=ABS(K):RETURN                        DE
·2000 B=INT(B*100+.001):B$=STR$(B):B$=LEF
 T$(B$,LEN(B$)-2)+"."+RIGHT$(B$,2)           JM
·2090 RETURN                                 IM
·3000 REM TRUNCATE P,C AND Z                 NA
·3010 B=P:GOSUB 2000                         NB
·3020 P$=B$                                  IO
·3030 B=C:GOSUB 2000                         MI
·3040 C$=B$                                  IH
·3050 B=Z:GOSUB 2000                         OD
·3060 Z$=B$                                  JE
·3090 RETURN                                 IM
·4000 REM TRUNCATE A AND J                   FH
·4010 B=J:GOSUB 2000                         ND
·4020 J$=B$                                  IE
·4030 B=A:GOSUB 2000                         LG
·4040 A$=B$                                  IJ
·4090 RETURN                                 IM
```

CHOPPER FLIGHT

FROM PAGE 117

```
·2 REM CHOPPER FLIGHT BY MIKE BUHIDAR JR.
 AND KEVIN WORAM                             PD
·4 CN=0:POKE832,0:BC=53280:GOTO12            BL
·6 PRINTTAB(10);                             AD
·8 D=D-8:POKECP,D:POKEPL,192:FORW=1TO12:N
 EXT:POKEPL,193                              LC
·10 GOSUB122:FORW=1TO12:NEXT:RETURN          ML
·12 M1=0:GOSUB258:GOSUB132:FA=3:D=215        IF
·14 POKEV,164:POKEV+31,0:GOSUB302            OK
·16 PRINT"[CLEAR][WHITE]ENTER SKILL LEVEL
 (1-6)"                                      BG
·18 RM=14:WS=11:GOSUB258                     EH
·20 GETSL$:IFVAL(SL$)<1ORVAL(SL$)>6THEN20    ED
·22 GOSUB132                                 CG
·24 POKEV+31,0:LS=192:Q=4:M=88:U=83          MH
·26 BR$="[RIGHT][RIGHT][c 2][RVSON][c R][
 c E][c R][c E][c R][c E][c R][c E][c R][
 c E]":B2$="[RIGHT][RIGHT][c 2][RVSON][c
 R][c E][c R][c E][c R][c E][c R][c E][c
 R][c E]":HD=4-SL/3:GH=HD-1:MD=INT(GH*30)    IP
·28 WN$="[RIGHT][RIGHT][c 2][RVSON][c E][
 c R][c E][RVSOFF] [RVSON][c R][c E][c R]
 [RVSOFF] [RVSON][c E][c R][RVSOFF][c 5][
 s O][c Y][c V]":W2$="[c 5][c C][c Y][s P
 ][c 2][RVSON][c E][c R][c E][RVSOFF] [RV
 SON][c R][c E][c R][RVSOFF] [RVSON][c E]
 [c R][RVSOFF]":
 IFHD>3THENHD=3                              GD
·30 TR$="[RIGHT][RIGHT][c 2][RVSON][c E][
 c R][c E][c 5][4"[c Y]"][c 2][c R][c E][
 c R][RVSOFF]":OS$="[RIGHT][RIGHT][c 2][R
 VSON][c R][c E][c R][RVSOFF][4" "][RVSON
 ][c E][c R][c E][RVSOFF]"                   KL
·32 F$="[RIGHT][c 5][s @][RVSON][10" "][R
 VSOFF][s L][RVSOFF]":SB=13+(2*SL):POKEZ,
 PEEK(Z)AND239:TD=(7-SL)*10                  BN
·34 PRINT"[CLEAR][5"[DOWN]"]":RF$="[RIGHT
 ][c 5][s P][RVSON][10"[c P]"][RVSOFF][s
 O]":PRINTRF$SPC(RM)RF$:POKEV+1,Y:POKEV,X    EG
·36 GOSUB374                                 CO
·38 PRINT"[UP]"BR$SPC(N)BR$                  PL
·40 FORP=1TO5:PRINTWN$SPC(WS)W2$:PRINTBR$
 SPC(N)BR$:PRINTB2$SPC(N)B2$:NEXT            OF
·42 POKEZ,PEEK(Z)OR16                        MD
·44 TI$="[6"0"]":FORL4=1TOSB:FORK=1TOQ       PL
·46 PRINTWN$SPC(WS)W2$:GOSUB80               LM
·48 PRINTBR$SPC(N)BR$:GOSUB80                GH
·50 PRINTB2$SPC(N)B2$:GOSUB80:NEXT           OO
·52 MP=INT(RND(1)*2)*RM:PRINTTAB(13+MP)"[
 c 1][UP][s X]":NEXT                         PA
·54 PRINTWN$SPC(WS)W2$:GOSUB80               LM
·56 PRINTTR$SPC(15)TR$:GOSUB80:FORK=1TO3:
 PRINTOS$SPC(15)OS$:GOSUB80:NEXT             DH
·58 PRINTOS$SPC(5)"[c 5][6"[c P]"]"SPC(4)
 OS$                                         DI
·60 PRINTF$SPC(4)"[c 5][6"[s W]"]"SPC(4)F
 $;                                          FI
·62 PRINT"[c 5] [39"[c Y]"]":GOSUB80         IL
·64 CP=833:FORP=PEEK(V+1)TO211STEP2:D=D+8
 :POKEV+1,P:GOSUB8:NEXT:POKEPL,193           ML
·66 PRINT"[HOME][YELLOW][18"[DOWN]"][15"[
 RIGHT]"]YOU DID IT!":FORM=1TO2000:NEXT      OD
·68 ZZ=VAL(TI$):FORHH=0TO1000:NEXT:POKEV,
 0:GOSUB358                                  CI
·70 PRINT"[WHITE][6" "]PRESS TRIGGER TO P
 LAY AGAIN."                                 IH
·72 B=PEEK(JL)AND16:IFB=0THEN76              OK
·74 GOTO72                                   PD
·76 CLR:GOTO16                               MC
·78 REM JOYSTICK ROUTINE                     EM
·80 FR=(PEEK(JL)AND16)/16+1:ONFRGOTO110,1
 16                                          EP
·82 SP=192:XD=HD:YD=0:RETURN                 JD
·84 SP=194:XD=-HD:YD=0:RETURN                EG
·86 SP=LS:XD=0:YD=0:RETURN                   BN
·88 SP=LS:YD=-HD:XD=0:RETURN                 IL
·90 SP=LS:YD=HD:XD=0:RETURN                  HH
·92 SP=194:XD=-HD:YD=-HD:RETURN              PI
·94 SP=194:XD=-HD:YD=HD:RETURN               HP
·96 SP=192:XD=HD:YD=-HD:RETURN               MH
·98 SP=192:XD=HD:YD=HD:RETURN                AF
·100 RETURN                                  IM
```

```
•102 POKEBC,8:RETURN                                FJ
•104 POKEBC,2:RETURN                                EL
•106 POKEHF,20:X1=X:POKEV+40,2:GOSUB284             LJ
•108 REM SLOWER FALL                                JN
•110 GOSUB122:FA=FA+2:IFFA>50THEN252                PJ
•112 GOSUB240:RETURN                                OL
•114 REM FASTER FALL                                IC
•116 GOSUB122:IFFA<1THENFA=2                        HH
•118 FA=FA-2:GOSUB240:RETURN                        KO
•120 REM SOUND                                      BM
•122 POKEHF,7:POKELF,53:POKEHF,0:POKELF,0
:POKEHF,7:POKELF,163:POKELF,0:POKEHF,0              II
•124 FORG1=0TO(50-FA):NEXT                          EE
•126 POKEHF,7:POKELF,53:POKEHF,0:POKELF,0
:POKEHF,7:POKELF,163:POKELF,0:POKEHF,0              II
•128 RETURN                                         IM
•130 SPRITE INITIALIZATION                          DG
•132 PRINT"[CLEAR]":POKEBC,0:POKEBC+1,0             NJ
•134 V=53248:PL=2040:POKEV+21,7:X=170:Y=1
00:SP=192:POKEV+39,15:POKEPL,SP                     FB
•136 POKEPL+1,196:POKEV+40,12                       OO
•138 POKEPL+2,197:POKEV+28,4:POKEV+41,8:P
OKEV+37,7:POKEV+38,2                                HH
•140 POKEV+29,4:POKEV+23,4:PRINT"[CLEAR][
WHITE]READING DATA[3"."]"                           CI
•142 IFPEEK(12660)=150THEN148                       FH
•144 R=12288:FORG=1TO6:FORI=1TO63:READA:D
C=DC+A:POKER,A:R=R+1:NEXT:R=R+1:NEXT                IP
•146 IFDC<>27628THENPRINT"[CLEAR]ERROR IN
 DATA. . .":STOP                                    LG
•148 JL=56320:N=15:Z=53265:CD=53269                 BD
•150 POKEZ,PEEK(Z)AND247:POKEZ,(PEEK(Z)AN
D248)+7:RETURN                                      JP
•152 REM SPRITE DATA                                IB
•154 DATA0,0,0,0,0,0,0,0,0,1,255,255,0,1,
0,0,7,192,0,31,240                                  DD
•156 DATA192,63,136,224,63,4,255,255,2,25
5,255,130,0,63,130,0,47,252,0,15,248                FA
•158 DATA0,6,248,1,4,17,1,140,27,0,255,25
4,0,0,0,0,0,0,0,0,0                                 JN
•160 DATA0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,
7,192,0,31,240                                      HF
•162 DATA192,63,136,224,63,4,255,255,2,25
5,255,130,0,63,130,0,47,252,0,15,248                FA
•164 DATA0,6,248,1,4,17,1,140,27,0,255,25
4,0,0,0,0,0,0,0,0,0                                 JN
•166 DATA0,0,0,0,0,0,0,0,0,255,255,128,0,
128,0,3,224,0,15,248,0                              JB
•168 DATA17,252,3,32,252,7,64,255,255,65,
255,255,65,252,0,63,248,0,31,240,0                  DN
•170 DATA12,96,0,136,32,128,216,49,128,12
7,255,0,0,0,0,0,0,0,0,0,0                           BK
•172 DATA0,0,0,0,0,0,0,0,0,0,128,0,0,128,
0,3,224,0,15,248,0                                  FH
•174 DATA17,252,3,32,252,7,64,255,255,65,
255,255,65,252,0,63,248,0,31,240,0                  DN
•176 DATA12,96,0,136,32,128,216,49,128,12
7,255,0,0,0,0,0,0,0,0,0,0                           BK
•178 DATA0,0,0,0,62,0,0,119,0,0,239,128,0
,207,128,0,255,128,0,0,0                            JO
•180 DATA0,127,0,0,127,0,0,127,0,0,62,0,0
,62,0,0,62,0,0,28,0                                 HA
•182 DATA0,127,0,0,235,128,0,193,128,1,12
8,192,1,128,192,1,0,64,1,0,64                       HA
•184 DATA0,20,0,0,85,0,1,150,64,5,105,80,
5,170,80,38,170,152,42,170,168                      GK
•186 DATA46,170,184,91,190,229,122,255,17
3,119,255,221,90,255,165,27,190,232                 EP
•188 DATA46,170,184                                 GP
•190 DATA42,170,168,5,170,80,5,105,80,1,1
50,64,0,85,0,0,20,0,0,0,0                           FC
•192 REM SPRITE-DATA COLLISION                      BF
•194 XP=X-24:YP=Y-54:CX=INT(XP/8):CY=INT(
YP/8):BB=1104+CX+(40*CY)                            GK
•196 P1=PEEK(BB):P2=PEEK(BB+1):P3=PEEK(BB
+2):P4=PEEK(BB+3)                                   NI
•198 IFP1=UORP2=UORP3=UORP4=UTHENRETURN             LE
•200 IFP1=MORP2=MORP3=MORP4=MTHEN204                DN
•202 GOTO206                                        CE
•204 POKEH1,50:FORL=0TO49:NEXT:POKEH1,0             CD
•206 IFP1=(M)THEN226                                KK
•208 IFP2=(M)THEN228                                KD
•210 IFP3=(M)THEN230                                KN
•212 IFP4=(M)THEN232                                KK
•214 REM PUT EXPLOSION HERE                         EN
•216 E$="CRASHED INTO A BUILDING,"                  IP
•218 POKEHF,7:X=X-12:Y=Y-10:POKEV+4,X:POK
EV+5,Y:FORWA=1TO255:POKELF,WA:NEXT                  EE
•220 POKEV+21,0                                     FF
•222 POKEHF,0:POKELF,0:GOSUB268                     LM
•224 REM PICK UP MAN HERE                           GN
•226 MS=MS+1:POKEBB,U:RETURN                        HC
•228 MS=MS+1:POKEBB+1,U:RETURN                      DC
•230 MS=MS+1:POKEBB+2,U:RETURN                      EN
•232 MS=MS+1:POKEBB+3,U:RETURN                      EI
•234 POKEHF,7:X=X-12:Y=Y-10:POKEV+4,X:POK
EV+5,Y:FORWA=1TO255:POKELF,WA:NEXT                  EE
•236 POKEHF,0:POKELF,0:RETURN                       CI
•238 REM MOVEMENT ROUTINE                           CF
•240 JV=N-(PEEK(JL)ANDN)+1:TL=INT((VAL(TI
$))/TD)+1:GOSUB292                                  MJ
•242 IFPEEK(V+31)ANDX=XTHENGOSUB192                 AL
•244 ONTLGOSUB100,100,100,102,104,106               GH
•246 ONJVGOSUB86,88,90,100,84,92,94,100,8
2,96,98:LS=SP                                       CI
•248 POKEPL,SP:X=X+XD:POKEV,X:Y=PEEK(V+1)
+YD:POKEV+1,Y:POKEPL,SP+1:RETURN                    PO
•250 REM HOVERING ROUTINE                           DC
•252 FR=(PEEK(JL)AND16)/16+1:IFFR=2THENFA
=48:GOTO110                                         GI
•254 GOSUB240                                       CG
•256 GOSUB122:GOTO252                               II
•258 REM SOUND INITIALIZATION                       DL
•260 S=54272:FORQ=STOS+24:POKEQ,0:NEXT              GE
•262 POKES+24,15:POKES+5,18:POKES+6,33              LD
•264 POKES+4,129:HF=54273:LF=54272                  BL
```

```
•266 POKES+12,255:POKES+13,255:POKES+11,1
7:H1=54280:L1=54279:RETURN                   DO
•268 REM END ROUTINE                         IP
•270 POKEBC,0:CN=PEEK(832):CN=CN+1           GF
•272 PRINT"[DOWN][CLEAR][WHITE]CHOPPER V
-"CN;E$                                      MD
•274 PRINT"[DOWN]SEND FOR REPLACEMENT PIL
OT IMMEDIATELY![DOWN]":POKEV+5,0:POKE832
,CN                                          FK
•276 FORK=0TO999:NEXT:ZZ=VAL(TI$):GOSUB35
8                                            OF
•278 GOTO70                                  PF
•280 REM MISSILE MOVING ROUTINE              JD
•282 POKEHF,20:X1=INT(RND(0)*68)+144         FC
•284 FORY1=255TO0STEP-10:POKELF,(255-Y1)     EL
•286 POKEV+2,X1:POKEV+3,Y1:IFPEEK(V+30)AN
D1=1THENIFPEEK(V+30)AND2=2THEN300            JJ
•288 NEXT:POKEV+31,0:M1=0:RETURN             HI
•290 REM MISSILE SELECT                      KF
•292 M1=M1+1:IFM1<MDTHENRETURN               GK
•294 POKEHF,5:POKELF,5                       EJ
•296 IFM1>MD+10THEN282                       JP
•298 RETURN                                  IM
•300 POKEV+2,0:E$="DESTROYED BY ENEMY FIR
E,":GOTO218                                  JP
•302 REM TITLE SCREEN                        NG
•304 FORL=1TO22:PRINT:NEXT                   GG
•306 FORK=1TO3:PRINTTAB(19)"[c 5][s B]":N
EXT                                          CB
•308 T$(1)="[CYAN][s U][3"[s C]"][s I][s
U][s I][s U][s I][s U][s C][s C][s I][s
U][s C][s C][s I][s U][s C][s C][s I][s
U][s C][s C][s I][s U][3"[s C]"][s I]"       HK
•310 T$(2)="[s B] [s U][s I][6"[s B]"][s
U][s I][s B][s B][s U][s I][s B][s B][s
U][s I][s B][s B][s U][s C][s K][s B][s
U][s I] [s B]"                               KO
•312 T$(3)="[s B] [s B][s J][s K][s B][s
J][s K][6"[s B]"][s J][s K][s B][s B][s
J][s K][s B][s B][s J][s C][s I][s B][s
J][s K] [s B]"                               ND
•314 T$(4)="[s B] [s B][s U][s I][s B][s
U][s I][6"[s B]"][s U][s C][s K][s B][s
U][s C][s K][s B][s U][s C][s K][s B][s
U][s I][s U][s K]"                           LP
•316 T$(5)="[s B] [s J][s K][6"[s B]"][s
J][s K][3"[s B]"]  [s B][s B]  [s B][s J
][s C][s I][4"[s B]"]"                       GD
•318 T$(6)="[s J][3"[s C]"][s K][s J][s K
][s J][s K][s J][s C][s C][s K][s J][s K
]  [s J][s K]  [s J][s C][s C][s K][s J]
[s K][s J][s K]"                             AL
•320 T$(7)="":T$(8)="":J$(1)="[s U][3"[s
C]"][s I][s U][s I]  [s U][s C][s C][s I
][s U][s C][s C][s I][s U][s I][s U][s I
][s U][4"[s C]"][s I]"                       NE
•322 J$(2)="[s B][SS][s U][s C][s K][s B]
[s B][SS][SS][s J][s I][s U][s K][s B][s
U][s C][s K][4"[s B]"][s J][s C][s I][s
U][s C][s K]"                                MO
•324 J$(3)="[s B][SS][s J][s C][s I][s B]
[s B][3"[SS]"][s B][s B][SS][s B][s B][s
U][s I][s B][s J][s K][s B][SS] [s B][s
B][SS]"                                      DG
•326 J$(4)="[s B][SS][s U][s C][s K][s B]
[s B][3"[SS]"][s B][s B][SS][5"[s B]"][s
U][s I][s B][SS] [s B][s B][SS]"             GJ
•328 J$(5)="[s B][SS][s B][SS][SS][s B][s
J][s C][s I][s U][s K][s J][s I][s B][s
J][s K][5"[s B]"][SS] [s B][s B][SS]"        HF
•330 J$(6)="[s J][s C][s K][SS][SS][s J][
s C][s C][s K][s J][s C][s C][s K][s J][
s C][s C][s K][s J][s K][s J][s K][SS] [
s J][s K][SS]"                               BM
•332 BL$="[s B][19" "][s B]":N1$="[s B][W
HITE]MICHAEL BUHIDAR JR.[PURPLE][s B]"       KE
•334 TP$="[PURPLE][4" "][s U][11"[s C]"][
s I]":DB$="[s U][3"[s C]"][s K][WHITE]DE
SIGNED BY[PURPLE][s J][3"[s C]"][s I]"       HB
•336 AN$="[PURPLE][s B][8" "][WHITE]AND[P
URPLE][8" "][s B]":N2$="[s B][WHITE][4"
"]KEVIN WORAM[4" "][PURPLE][s B]"            GF
•338 CR$="[PURPLE][s B][WHITE]FOR AHOY! M
AGAZINE [PURPLE][s B]":ED$="[s J][19"[s
C]"][s K]"                                   EN
•339 SP$="[PURPLE][s B][19" "][PURPLE][s
B]"                                          MK
•340 CP=V+1:FORL=1TO7:GOSUB8:PRINTTAB(5)T
$(L):NEXT                                    DK
•342 FORL=1TO6:GOSUB8:PRINTTAB(7)J$(L):NE
XT                                           GC
•344 PRINT:GOSUB8                            JL
•346 GOSUB6:PRINTTP$:GOSUB6:PRINTDB$:GOSU
B6:PRINTBL$:GOSUB6                           GL
•348 PRINTN1$:GOSUB6:PRINTAN$:GOSUB6:PRIN
TN2$                                         PG
•350 GOSUB6:PRINTCR$:GOSUB6:PRINTSP$:GOSU
B6:PRINTED$:GOSUB6                           JE
•352 PRINTTAB(10)"[WHITE]PRESS TRIGGER TO
 PLAY"                                       AB
•354 B=PEEK(JL)AND16:IFB=0THENRETURN         PP
•356 GOTO354                                 CE
•358 REM FINAL SCORE                         IG
•360 POKEBC,0:FS=100*MS*SL+(500-ZZ):TS=(4
0-(14+MS))/2                                 EK
•362 IFMS=0THENPRINT"[CLEAR]":PRINTTAB(13
)"[PURPLE]NO MEN RESCUED[WHITE]":GOTO370     AJ
•364 PRINT"[CLEAR][WHITE]":PRINTTAB(TS)"M
EN RESCUED:  ";:FORMR=1TOMS:PRINT"[c 1][
s X]";:NEXT:PRINT                            AJ
•366 PRINTTAB(14)"[WHITE]BONUS:  ";:FORHH
=1TOMS:O=O+100:POKEH1,100:FORM=1TO150:NE
XT                                           OD
•368 POKEH1,0:PRINT"[HOME][DOWN][DOWN]"TA
B(21)O;:NEXT:PRINT                           DH
•370 PRINTTAB(11)"[8"[DOWN]"]YOUR SCORE:
```

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```
"FS"[DOWN]"                                  AE
·372 FORJJ=0TO1000:NEXT:RETURN               OG
·374 REM MOVEMENT CHECKER                    BE
·376 RESTORE                                 IO
·378 R=12288:FORG=1TO6:FORI=1TO63:READA:D
C=DC+A:R=R+1:NEXT:R=R+1:NEXT                 AP
·380 DATA173,1,208,201,50,144,7,201,229,1
76,11,76,49,234,105,4,141,1,208,76           HH
·382 DATA49,234,233,4,141,1,208,76,49,234    MJ
·384 REM INTERRUPT SETUP                     OG
·386 DATA120,169,0,141,20,3,169,192,141,2
1,3,88,96                                    DA
·388 FORP=49152TO49194:READA:POKEP,A:NEXT    FM
·390 SYS49182:RETURN                         GJ
```

FILE SCOUT

FROM PAGE 70

```
·1 REM ********************************      DN
·2 REM *                              *      OO
·3 REM *     FILE SCOUT V0619/85      *      JA
·4 REM *        (RV 0316/84)          *      GB
·5 REM *                              *      OO
·6 REM ********************************      DN
·7 REM                                       JD
·10 POKE 53280,12:POKE 53281,0 :PRINT CHR
$(147)CHR$(154);                             CA
·16 H$="0123456789ABCDEF"                    OA
·20 GOTO 1000                                FC
·50 REM LOCATE                               FC
·51 POKE 214,RW:POKE 211,CL:SYS 58640:RET
URN                                          AF
·60 REM SET ROW, COLUMNS FOR SCAN            CG
·61 DIM RW(35),CL(35)                        GE
·62 FOR I=0 TO 16:RW(I)=I+6:CL(I)=4:NEXT
I                                            MC
·63 FOR I=17 TO 34:RW(I)=(I+6)-17:CL(I)=1
9:NEXT I                                     AG
·65 RETURN                                   IM
·99 :                                        DI
·100 REM ** COLLECT ALL THE ACTIVE FILES
AND THEIR FIRST TRACK & SECTORS **           AC
·101 RW=5:CL=6 :GOSUB 50:PRINT "READING D
IRECTORY";                                   IM
·105 OPEN 15,8,15,"U;"                       PH
·110 N1=144:DIM F$(N1),T(N1),S(N1),B(N1),
FT$(N1)                                      IA
·115 OPEN 2,8,2,"#2"                         GP
·120 TD=18:TS=1:NF=0                         DI
·130 PRINT#15,"U1:2,8,"TD,TS                 IF
·140 GET#2,A$:TD=ASC(A$+CHR$(0)):GET#2,A$
:TS=ASC(A$+CHR$(0))                          EJ
·145 FOR K=0 TO 7                            IJ
·150 GET#2,A$:IF ASC(A$+CHR$(0))=0 THEN G
OSUB 300:GOTO 230                            PJ
·151 A=ASC(A$):IF (A AND 64)=0 THEN FT$(N
F)="[SS]":GOTO 153                           PF
·152 FT$(NF)=">"                             NI
·153 A=(A AND(255-64))                       CK
·155 IF A=129 THEN FT$(NF)=FT$(NF)+"SEQ"     JD
·156 IF A=130 THEN FT$(NF)=FT$(NF)+"PRG"     IH
·157 IF A=131 THEN FT$(NF)=FT$(NF)+"USR"     NL
·160 GET#2,A$:GET#2,B$:T(NF)=ASC(A$+CHR$(
0)):S(NF)=ASC(B$+CHR$(0))                    PO
·165 FOR J=0 TO 15:GET#2,A$                  HG
·170 IF A$=CHR$(160) THEN GOTO 190           CE
·180 F$(NF)=F$(NF)+A$                        HK
·190 NEXT J                                  MM
·199 :                                       DI
·200 FOR J=0 TO 8:GET#2,A$:NEXT J            FB
·210 GET#2,A$:GET#2,B$:B(NF)=ASC(A$+CHR$(
0))+ASC(B$+CHR$(0))*256:BA=BA+B(NF)          NL
·224 NF=NF+1                                 MG
·225 GET#2,A$:GET#2,A$                       GE
·230 NEXT K                                  MP
·240 IF TD<>18 THEN GOTO 245                 PA
·241 IF TS<1 OR TS>19 THEN GOTO 245          KA
·242 GOTO 130                                CA
·245 IF NF=0 THEN PRINT"NO FILES":END        JD
·246 CLOSE2:BF=664-BA:RETURN                 OK
·299 :                                       DI
·300 FOR J=0 TO 30                           KF
·310 GET#2,A$:NEXTJ                          JP
·320 RETURN                                  IM
·399 :                                       DI
·400 REM SCAN FOR T & S                      GP
·405 RW=24:CL=1:GOSUB 50:PRINT BL$;          FK
·410 RW=23:CL=2:GOSUB 50:F$="":K1=-1:PRIN
T CHR$(158);:INPUT "FILE NAME";F$            DG
·411 IF F$="" THEN RW=23:CL=1:PRINT BL$;:
RETURN                                       AE
·412 LN=LEN(F$):IF RIGHT$(F$,1)="*" THEN
LN=LEN(F$)-1:F$=LEFT$(F$,LN)                 IF
·420 FOR K=0 TO NF                           OP
·422 IF K1<>-1 THEN GOTO 430                 CF
·425 IF F$=LEFT$(F$(K),LN) THEN K1=K         MJ
·430 NEXT K                                  MP
·431 IFK1=-1THENPRINT "[4" "]NOT FOUND";:
FOR K=0TO2000:NEXTK:PRINTCHR$(154);:RETU
RN                                           II
·435 TR=T(K1):SC=S(K1)                       EF
·440 BC=0:C=0:T4$="TRK SEC"                  HB
·445 PRINT#15,"I0:":CLOSE2: OPEN 2,8,2,"#
2"                                           KM
·450 PRINT HD$;:RW=2:CL=1:GOSUB 50:PRINT
F$(K1);                                      MB
·455 RW=4:CL=6:GOSUB 50:PRINT T4$;           AD
·460 RW=RW(C):CL=CL(C):GOSUB 50:PRINT BC;
TR;SC                                        KP
·465 GOSUB 590:IF TR=0 THEN GOTO 480         HH
·470 BC=BC+1:C=C+1                           OE
```

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```
•475 IF C<34 THEN GOTO 460                      LO
•480 RW=24:CL=10:GOSUB 50:PRINT CHR$(5) "
NEXT  PRINT  RETURN ";                          KI
•482 GOSUB 700:PRINT A$CHR$(158);               GM
•490 IF A$="N" AND BC<B(K1)-1 THEN C=0:GO
TO 450                                          AN
•492 IF A$="N" AND BC=B(K1)-1 THEN GOTO 4
35                                              MA
•495 IF A$="P" THEN GOSUB 500:GOTO 435          FC
•496 IF A$="R" THEN CLOSE 2:PRINT CHR$(15
4);:RETURN                                      HJ
•497 GOTO 482                                   CK
•499 :                                          DI
•500 REM PRINT OUT FOR T & S                    KJ
•505 OPEN 4,4:BC=0                              ME
•510 PRINT#4,F$(K1)                             EB
•515 TR=T(K1):SC=S(K1)                          EF
•520 PRINT#4,CHR$(13)CHR$(13)T4$CHR$(13)C
HR$(13)                                         OA
•525 PRINT#4,BC,TR,SC                           BM
•530 GOSUB 590:BC=BC+1                          DB
•535 IF TR=0 THEN PRINT#4:CLOSE4:RETURN         HA
•540 GOTO 525                                   CK
•590 PRINT#15,"U1:2,8",TR,SC                    FG
•595 GET#2,A$:TR=ASC(A$+CHR$(0))                GK
•596 GET#2,A$:SC=ASC(A$+CHR$(0))                NK
•597 RETURN                                     IM
•599 :                                          DI
•600 REM ** GET LOAD ADDR PRG FILES **          IN
•605 DIM LA(N1),LH$(N1)                         KI
•610 OPEN 2,8,2,"#2"                            GP
•620 FOR I=0 TO NF-1                            NI
•625 IF RIGHT$(FT$(I),3)<>"PRG" THEN LA(I
)=-1:GOTO 650                                   EF
•630 PRINT#15,"U1:2,8,"T(I),S(I)                DD
•632 PRINT#15,"B-P:"2,0                         OL
•635 GET#2,A$:GET#2,A$:GET#2,A$:GET#2,B$        AE
•636 A=ASC(A$+CHR$(0)):B=ASC(B$+CHR$(0))        NC
•640 LA(I)=A +B*256                             HH
•641 BH=INT(B/16):BL=B-(BH*16)                  OO
•642 AH=INT(A/16):AL=A-(AH*16)                  ND
•643 LH$(I)=MID$(H$,BH+1,1)+MID$(H$,BL+1,
1)                                              OF
•644 LH$(I)="$"+LH$(I)+MID$(H$,AH+1,1)+MI
D$(H$,AL+1,1)                                   KB
•650 NEXT I                                     MN
•655 CLOSE 2:RETURN                             JP
•699 :                                          DI
•700 REM GET CHAR FROM KB, WITH CURSOR          DA
•705 POKE 198,0:POKE 204,0                      HG
•710 GET A$:POKE 207,0:IF A$="" THEN GOTO
 710                                            CK
•715 POKE 204,1:PRINT " "CHR$(157);:RETUR
N                                               KP
•725 CLOSE15:OPEN 15,8,15,"I0:"                 FK
•730 INPUT#15,A$,B$,C$,D$:CLOSE15               IJ
•735 IF A$="00" THEN RETURN                     HB
•740 PRINT:PRINT:PRINT"DISK ERROR":STOP         EE
•749 :                                          DI
•750 REM GET DISK NAME & ID                     GL
•760 OPEN 15,8,15,"U;"                          PH
•770 OPEN 2,8,2,"#2"                            GP
•775 TD=18:TS=0:PRINT#15,"U1:2,8,"TD,TS         PH
•780 PRINT#15,"M-R"CHR$(144)CHR$(5)CHR$(2
0)                                              LP
•782 FOR I=0 TO 19:GET#15,A$:DN$=DN$+A$:N
EXT I                                           IH
•795 CLOSE2:CLOSE15:RETURN                      ON
•799 :                                          DI
•800 T1$=DN$+NF$                                HA
•801 T2$="BLOCKS ALLOC:[SS]"+STR$(BA)+" B
LOCKS FREE: "+STR$(BF)+" "                      MH
•802 T3$="FILE[12" "]TYPE TRK SEC BLK ADD
R.D ADDR.H":S1$="[5" "]"                        KP
•805 OPEN 4,4:CMD 4                             EL
•808 PRINT S1$T1$:PRINT S1$T2$:PRINT:PRIN
T S1$T3$:PRINT                                  JE
•810 FOR K=0 TO NF-1                            MO
•820 PRINT S1$F$(K);:FOR J=0TO16-LEN(F$(K
)):PRINT" ";:NEXT J:PRINT FT$(K);               JM
•829 SP$="[6" "]"                               HK
•830 A$=STR$(T(K)):A$=A$+RIGHT$(SP$,3-LEN
(A$))                                           JH
•831 B$=STR$(S(K)):B$=B$+RIGHT$(SP$,3-LEN
(B$))                                           BG
•832 C$=STR$(B(K)):C$=C$+RIGHT$(SP$,4-LEN
(C$))                                           JC
•840 PRINT A$SPC(1)B$SPC(1)C$SPC(1);:IF L
A(K)<0 THEN PRINT SP$;:GOTO 845                 ID
•841 D$=STR$(LA(K)):D$=D$+RIGHT$(SP$,6-LE
N(D$)):PRINT D$SPC(1)                           KC
•845 PRINT LH$(K)                               PI
•850 NEXT K                                     MP
•860 PRINT#4,CHR$(13):PRINT#4:CLOSE4:RETU
RN                                              HJ
•899 :                                          DI
•1000 REM ** MAIN ROUTINE **                    JB
•1001 R0$=CHR$(146):R9$=CHR$(18):CL$=CHR$
(147)                                           KD
•1002 BL$="[38" "]"                             OL
•1003 HD$=CL$+R9$+"[11" "]FILE SCOUT V061
9/85[10" "]"+R0$                                JL
•1004 PRINT HD$;:GOSUB 60                       LP
•1005 RW=3:CL=1:GOSUB 50:PRINT "INSERT DI
SK AND HIT A KEY ";                             JN
•1006 GOSUB 700:GOSUB 725:GOSUB 750             PE
•1010 GOSUB 100:GOSUB 600                       IH
•1015 PRINT                                     JJ
•1400 NF$=STR$(NF):L=LEN(NF$)                   CN
•1401 FL$=RIGHT$(BL$,9-L)                       HM
•1405 NF$= " # FILES : "+NF$+FL$                IK
•1410 TH$=CL$+R9$+DN$+NF$                       AB
```

```
•1501 SP$="[9" "]":L=LEN(STR$(BA))+LEN(ST
 R$(BF)):FL$=RIGHT$(SP$,14-L)              IJ
•1502 TJ$=R9$+"BLOCKS ALLOC:"+STR$(BA)+"
 BLOCKS FREE:"+STR$(BF)+FL$                IL
•1503 TL$=R9$+"FILE[13" "]TYPE TRK SEC BL
 K ADDR  "+R0$:I=0                         MB
•1505 PRINT TH$;:PRINT TJ$:PRINT TL$:PRIN
 T                                         HN
•1520 PRINT F$(I);:FOR J=0TO16-LEN(F$(I))
 :PRINT" ";:NEXT J:PRINT FT$(I);           FE
•1529 SP$="[6" "]"                         HK
•1530 A$=STR$(T(I)):A$=A$+RIGHT$(SP$,3-LE
 N(A$))                                    CN
•1531 B$=STR$(S(I)):B$=B$+RIGHT$(SP$,3-LE
 N(B$))                                    BM
•1532 C$=STR$(B(I)):C$=C$+RIGHT$(SP$,4-LE
 N(C$))                                    OI
•1540 PRINT A$SPC(1)B$SPC(1)C$;:IF LA(I)<
 0 THEN GOTO 1545                          AA
•1541 PRINT STR$(LA(I))                    ND
•1545 PRINT SPC(34)LH$(I)                  EO
•1546 I=I+1:IF I=NF THEN GOTO 1548         IN
•1547 IF I/8-INT(I/8)<>0 THEN GOTO 1520    CJ
•1548 RW=24:CL=5:GOSUB 50:PRINT CHR$(5)"
 NEXT SCOUT PRINT BOOT QUIT?[SS]";         HG
•1549 GOSUB 700:PRINT A$;:PRINT CHR$(154)
 ;                                         EN
•1550 IF A$="P" THEN GOSUB 800:PRINT CHR$
 (20);:GOTO 1548                           EL
•1555 IF A$="S" THEN GOSUB 400:GOTO 1580   MO
•1560 IF A$="Q" THEN STOP                  HE
•1565 IF A$="B" THEN CLR:GOTO 10           KH
•1570 IF A$<>"N" THEN GOTO 1548            PG
•1575 IF I<NF THEN GOTO 1505               CP
•1580 I=0:GOTO 1505                        MN
•5999 :                                    DI
•6000 CLOSE15:OPEN 15,8,15,"I0:":PRINT#15
 ,"S0:FILE SCOUT V0619":CLOSE15            MI
•6005 SAVE "FILE SCOUT V0619",8:STOP       HN
•6100 CLOSE15:OPEN 15,8,15:INPUT#15,A$,B$
 ,C$,D$:CLOSE15                            CE
•6101 PRINT A$"[SS]"B$"[SS]"C$"[SS]"D$:ST
 OP                                        MG
```

THE KNIGHT'S TOUR

FROM PAGE 73

```
•100 REM * KNIGHT'S TOUR / COMMODORE 64 /
  RAMELLA                                  OD
•101 POKE 53280,0: POKE 53281,0            BH
•102 PRINT "[CLEAR][c 3]": V=53248: POKE
 V+34,4: POKE 53269,4: POKE 2042,13        JK
•103 FOR N=0 TO 62: READ A: POKE 832+N,A:
 NEXT: L=53: H=28                          LH
•105 PRINT"[WHITE]";SPC(33);"KNIGHT": PRI
 NT: PRINT SPC(33);"TOUR": PRINT "[RED]"   ML
•106 PRINT: PRINT: PRINT: PRINT: PRINT "[
 BLUE]":PRINT SPC(33);"SCORE:": PRINT "[H
 OME]";                                    HM
•107 PRINT "[RED]"                         PP
•110 T$="[s O][3"[c Y]"][s O][3"[c Y]"][s
 O][3"[c Y]"][s O][3"[c Y]"][s O][3"[c Y
 ]"][s O][3"[c Y]"][s O][3"[c Y]"][s O][3
 "[c Y]"][c H]"                            KO
•112 N$="[c H][3" "][c H][3" "][c H][3" "
 ][c H][3" "][c H][3" "][c H][3" "][c H][
 3" "][c H][3" "][c H]"                    EA
•115 FOR X=1 TO 8: PRINT T$: PRINT N$: PR
 INT N$: NEXT                              EI
•116 PRINT"[UP][s L][3"[c P]"][s L][3"[c
 P]"][s L][3"[c P]"][s L][3"[c P]"][s L][
 3"[c P]"][s L][3"[c P]"][s L][3"[c P]"][
 s L][3"[c P]"]"                           NJ
•120 GOSUB 5000                            FK
•150 GETA$: IF A$<>"A" AND A$<>"Z" AND A$
 <>"," AND A$<>"." AND A$<>"K" THEN 150    HA
•152 IF A$="K" THEN 245                    GM
•155 IF H=252 AND A$="." THEN 150          JB
•160 IF A$="." THEN FOR H=H TO H+32 STEP
 4                                         IJ
•165 IF H=28 AND A$="," THEN 150           IH
•170 IF A$="," THEN FOR H=H TO H-32 STEP
 -4                                        GJ
•175 IF L=221 AND A$="Z" THEN 150          MD
•180 IF A$="Z" THEN FOR L=L TO L+24 STEP
 2                                         FE
•185 IF L=53 AND A$="A" THEN 150           GC
•190 IF A$="A" THEN FOR L=L TO L-24 STEP
 -2                                        EL
•200 GOSUB 5000: NEXT                      BL
•210 IF A$="." THEN H=H-4: P=P+4           FD
•220 IF A$="," THEN H=H+4: P=P-4           LH
•230 IF A$="Z" THEN L=L-2: P=P+120         OP
•235 IF A$="A" THEN L=L+2: P=P-120         AA
•240 GOTO 150                              CG
•245 S$="": H1=H: L1=L: P1=P               OP
•250 GET A$: IF A$<>"A" AND A$<>"Z" AND A
 $<>"," AND A$<>"." THEN 250               CI
•252 S$=S$+A$                              KE
•255 IF H=252 AND A$="." THEN 385          JL
•260 IF A$="." THEN FOR H=H TO H+32 STEP
 4                                         IJ
•265 IF H=28 AND A$="," THEN 385           IL
•270 IF A$="," THEN FOR H=H TO H-32 STEP
 -4                                        GJ
•275 IF L=221 AND A$="Z" THEN 385          OF
•280 IF A$="Z" THEN FOR L=L TO L+24 STEP
 2                                         FE
•285 IF L=53 AND A$="A" THEN 385           GG
•290 IF A$="A" THEN FOR L=L TO L-24 STEP
 -2                                        EL
•300 GOSUB 5000: NEXT                      BL
•310 IF A$="." THEN H=H-4: P=P+4           FD
•320 IF A$="," THEN H=H+4: P=P-4           LH
•330 IF A$="Z" THEN L=L-2: P=P+120         OP
```

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```
•335 IF A$="A" THEN L=L+2: P=P-120               AA
•337 IF LEN(S$)=3 THEN 350                        FD
•340 GOTO 250                                     CD
•350 IF S$="AA." OR S$=".AA" OR S$="A.."
 OR S$="..A" OR S$="..Z" THEN W=1                 DF
•360 IF S$="Z.." OR S$="ZZ." OR S$=".ZZ"
 OR S$="ZZ," OR S$=",ZZ" THEN W=1                 JJ
•370 IF S$=",,Z"OR S$="Z,,"OR S$=",,A"OR
 S$="A,,"OR S$="AA,"OR S$=",AA"THEN W=1           GG
•375 IF PEEK(1024+P)=81 THEN 385                  ML
•380 IF W=1 THEN W=0: GOTO 400                    OM
•385 P=P1: H=H1: L=L1: GOSUB 5000: W=0: G
 OTO 245                                          DO
•390 GOTO 245                                     CJ
•400 FOR G=P TO P+80 STEP 40: FOR R=G TO
 G+3                                              OL
•410 POKE 1024+R,81: POKE 55296+R,14: NEX
 T R,G                                            KM
•411 TL=TL+1: TL$=STR$(TL): FOR JF=2 TO L
 EN(TL$)                                          PH
•412 POKE 1537+JF,ASC(MID$(TL$,JF,1)): NE
 XT JF                                            BH
•420 GOTO 245                                     CJ
•5000 POKE V+4,H: POKE V+5,L: RETURN              JK
•10000 DATA 0,31,128,0,255,224,1,255,240          IP
•10010 DATA 3,255,248,7,231,254,15,255,25
 2                                                AM
•10020 DATA 31,255,252,63,255,255,127,255
 ,252                                             HE
•10030 DATA 255,255,254,255,255,255,127,1
 59,252                                           CN
•10040 DATA 60,15,254,0,31,255,0,31,252           JM
•10050 DATA 0,63,254,0,255,255,1,255,252          GF
•10060 DATA 7,255,254,31,255,255,63,255,2
 55                                               BD
•10070 END                                        IC
```

RHYTHMIC BITS
FROM PAGE 76

```
•40 POKE 53280,1:POKE53281,3                      BP
•50 POKE 650,255                                  AD
•100 GOSUB 2000                                   FL
•200 PRINT"[CLEAR]"                               HH
•210 PRINT"[13" "]RHYTHMIC BITS"                  AD
•220 PRINT"[12" "]BY DAVID BARRON"                OC
•230 PRINT"[6"[DOWN]"](F1) - DEFINE SOUND
 S"                                               JA
•240 PRINT"[DOWN](F3) - ENTER RHYTHMIC PA
 TTERN"                                           HG
•250 PRINT"[DOWN](F5) - CHANGE FILTER"            LA
•255 PRINT"[DOWN](F6) - SET SPEED"                OA
•260 PRINT"[DOWN](F7) - PLAY PATTERN"             PC
•270 PRINT"[DOWN][DOWN][4" "]- ENTER YOUR
  SELECTION -"                                    AO
•280 GET T$:IF T$="" THEN 280                     JP
•290 IF T$="[F1]" THEN 1000                       PJ
•295 IF T$="[F3]" THEN 5500                       AP
•300 IF T$="[F5]" THEN 350                        MG
•305 IF T$="[F6]" THEN 500                        OF
•310 IF T$="[F7]" THEN 6000                       AL
•320 GOTO 280                                     CG
•350 PRINT "[CLEAR][12" "]FILTER CHANGE"          EP
•352 PRINT"[13"[DOWN]"](F1) - INCREASE"           AF
•353 PRINT"(F3) - DECREASE"                       HM
•354 PRINT"(F7) - QUIT"                           EF
•360 PRINT"[HOME][6"[DOWN]"]LOW:[31" "]:H
 IGH"                                             EG
•380 PRINT"[HOME][5"[DOWN]"]"                     EP
•385 REM                                          JD
•390 PRINT TAB(5+FI/10);" [RVSON] [RVSOFF
 ] [UP]"                                          OC
•400 GET T$:IF T$="" THEN 400                     JB
•410 IF T$="[F1]" THEN FI=FI+1:IF FI>255
 THEN FI=255                                      FB
•420 IF T$="[F3]" THEN FI=FI-1:IF FI<0 TH
 EN FI=0                                          GP
•425 IF T$="[F7]" THEN 440                        NP
•430 GOTO 385                                     CK
•440 POKE SID+22,FI                               FC
•450 GOTO 200                                     BO
•500 PRINT "[CLEAR][12" "]SPEED CHANGE"           CH
•552 PRINT"[13"[DOWN]"](F1) - DECREASE"           HB
•553 PRINT"(F3) - INCREASE"                       GK
•554 PRINT"(F7) - QUIT"                           EF
•560 PRINT"[HOME][5"[DOWN]"]FAST:[30" "]:
 SLOW"                                            NA
•580 PRINT"[HOME][4"[DOWN]"]"                     DC
•585 REM                                          JD
•590 PRINT TAB(5+SP/10);" [RVSON] [RVSOFF
 ] [UP]"                                          BM
•600 GET T$:IF T$="" THEN 600                     IL
•610 IF T$="[F1]" THEN SP=SP+1:IF SP>254
 THEN SP=254                                      IH
•620 IF T$="[F3]" THEN SP=SP-1:IF SP<0 TH
 EN SP=0                                          HH
•625 IF T$="[F7]" THEN 640                        NB
•630 GOTO 585                                     DE
•640 POKE 49164,SP+1                              EI
•650 GOTO 200                                     BO
•1000 PRINT"[CLEAR]":POKE 650,255:IF V>7
 THEN V=0                                         GE
•1020 PRINT"[DOWN][DOWN]"                         PN
•1030 PRINT"[6"[DOWN]"]FREQUENCY:[DOWN]"          FE
•1040 PRINT     "DECAY[4" "]:[DOWN]"              BF
•1050 PRINT"WAVE TYPE:"                           LL
•1051 PRINT "[DOWN]USE (F1) FOR FREQUENCY
  INCREASE"                                       OO
•1052 PRINT "USE (F2) FOR FREQUENCY DECRE
 ASE"                                             NC
•1053 PRINT "USE (F3) FOR ATTACK INCREASE
 "                                                BA
```

```
•1054 PRINT "USE (F4) FOR ATTACK DECREASE
"                                          NB
•1055 PRINT "USE (F5) TO CHANGE WAVEFORM" KC
•1056 PRINT"USE (F7) TO CHANGE SOUND NUMB
ER"                                        BI
•1057 PRINT"USE (SPACEBAR) TO TEST SOUND" AH
•1058 PRINT"USE (X) TO EXIT"              OB
•1059 PRINT"[HOME][DOWN][DOWN][4" "]SOUND
 DEFINITION FOR VOICE #";V                PD
•1060 PRINT"[HOME][10"[DOWN]"][10"[RIGHT]
"]";                                       PE
•1062 BASE=12*4096+256+V*4                LJ
•1063 F=PEEK(BASE)+PEEK(BASE+1)*256       DH
•1064 D=PEEK(BASE+2):GOSUB 3000           FE
•1066 IF D>15 THEN D=15                   OH
•1067 IF S>2 THEN S=2                     KE
•1070 FOR X=1 TO (F/65535)*28             JK
•1080 PRINT "[RVSON] ";:NEXT X:PRINT"[RVS
OFF] ";                                    EK
•1090 PRINT"[DOWN]":PRINT"[10"[RIGHT]"]"; FO
•1100 FOR X=1 TO D*1.7                    PA
•1110 PRINT "[RVSON] ";:NEXT X:PRINT"[RVS
OFF]  ";                                   EC
•1120 PRINT"[DOWN]":PRINT"[10"[RIGHT]"]"; FO
•1130 IF S=0 THEN PRINT"TRIANGLE":S1=16   ND
•1140 IF S=1 THEN PRINT"SAWTOOTH":S1=32   AN
•1150 IF S=2 THEN PRINT"NOISE[5" "]":S1=1
28                                         MC
•1160 GET I$:IF I$="" THEN 1160           NG
•1170 IF I$="[F1]"THEN F=F+(200[UPARROW](
1.25+F/650000)):IF F>65535 THEN F=65535   IH
•1180 IF I$="[F2]"THEN F=F-(200[UPARROW](
1.25+F/650000)):IF F<0 THEN F=0           GK
•1190 IF I$="[F3]"THEN D=D+1:IF D>15THEN
D=D-1                                      EF
•1200 IF I$="[F4]"THEN D=D-1:IF D<0 THEN
D=D+1                                      MO
•1210 IF I$="[F5]" THEN GOSUB 2200        GB
•1220 IF I$="[F7]"THEN V=V+1:IF V>7 THEN
V=0                                        CE
•1225 IF I$="[F7]"THEN GOTO 1000          FP
•1230 IF I$=" " THEN POKE SID+4,S1:POKESI
D+4,S1+1                                   HF
•1235 IF I$="X" THEN 200                  IM
•1240 POKE SID,F-INT(F/256)*256           LO
•1250 POKE SID+1,INT(F/256)               AJ
•1260 POKE SID+6,D+240                    CG
•1270 POKE SID+4,S1                       BJ
•1280 POKE BASE,F-INT(F/256)*256          BB
•1290 POKE BASE+1,INT(F/256)              FI
•1300 POKE BASE+2,D:POKE BASE+3,S1        KM
•1500 GOTO 1059                           GE
•2000 REM INITIALIZE SID CHIP             JD
•2005 SID=54272:FI=128:SP=128             KD
•2010 FOR X=0 TO 28                       NM
•2020 POKE SID+X,0:NEXT X                 AE
•2030 POKE SID+21,7:POKE SID+23,7:POKE SI
D+22,FI                                    FA
•2040 POKE SID+24,31                      AF
•2050 RETURN                              IM
•2200 S=S+1:IF S>2 THEN S=0               AI
•2205 IF S=0 THEN S1=16                   AK
•2210 IF S=1 THEN S1=32                   BN
•2220 IF S=2 THEN S1=128                  DL
•2230 RETURN                              IM
•3000 S1=PEEK(BASE+3)                     DK
•3010 IF S1=16 THEN S=0:RETURN            NL
•3020 IF S1=32 THEN S=1:RETURN            OK
•3030 IF S1=128 THEN S=2:RETURN           BI
•3040 S1=16:S=0                           CK
•3050 RETURN                              IM
•5000 DATA 1,2,1,4,1,2,1,4,1,2,1,4,1,2,1,
4,1                                        GG
•5010 FOR X=49152+512 TO 49152+512+16     HG
•5020 READ A:POKE X,A:NEXT                BA
•5500 PRINT "[CLEAR][13" "]PATTERN ENTRY" EK
•5510 PRINT"[4"[DOWN]"][17" "][10"1"][10"
2"][3"3"]"                                 IG
•5520 PRINT"[UP][8" "]1234567890123456789
0123456789012"                             HP
•5525 PRINT"[UP][UP]"                     PN
•5530 FOR X=0  TO 7                       KA
•5550 PRINT "VOICE";X;"[LEFT]:"           BJ
•5560 NEXT X                              NK
•5570 PRINT "[40"[s *]"][UP]"             DB
•5580 GOSUB 5850                          GN
•5585 PRINT"[3"[DOWN]"]CURSOR KEYS MOVE C
URSOR"                                     IH
•5586 PRINT"USE (F7) TO EXIT"             KJ
•5587 PRINT"SPACEBAR TOGGLES MARKER"      MN
•5588 PRINT"USE (F3) TO CLEAR PATTERN"    AJ
•5600 V=0:X=0                             LL
•5610 LOC=40*7+V*40+8+X                   MD
•5620 POKE 1024+LOC,PEEK(1024+LOC)OR128:P
OKE55296+LOC,14                            EB
•5630 GET A$:IF A$="" THEN 5630           MC
•5640 IF A$=" " THEN IF PEEK(1024+LOC)=86
+128THEN POKE 1024+LOC,160:GOTO 5650      EA
•5645 IF A$=" " THEN IF PEEK(1024+LOC)=16
0THEN POKE 1024+LOC,86+128                MK
•5650 IF A$="[RIGHT]" THEN X=X+1          AO
•5660 IF A$="[LEFT]" THEN X=X-1           FG
•5670 IF A$="[DOWN]" THEN V=V+1           OC
•5675 IF A$="[F3]" THEN FOR X=49152+512 T
O 49152+512+32:POKE X,0:NEXT X:GOTO 5500 JM
•5680 IF A$="[UP]" THEN V=V-1             GK
•5685 IF A$="[F7]" THEN GOTO 5750         JN
•5690 POKE 1024+LOC,PEEK(1024+LOC)AND127  CB
•5700 IF X<0 THEN X=0                     KM
•5710 IF X>31 THEN X=31                   AD
•5720 IF V<0 THEN V=0                     KI
•5730 IF V>7 THEN V=7                     ME
•5740 GOTO 5610                           GD
•5750 PRINT"WORKING.";                    HI
•5752 FOR X=0 TO 30                       MD
•5755 S=0                                 DM
```

To enter **Lightning Loader** ...you must use our *Flankspeed* machine language entry program. Read the instructions for *Flankspeed* on page 122.

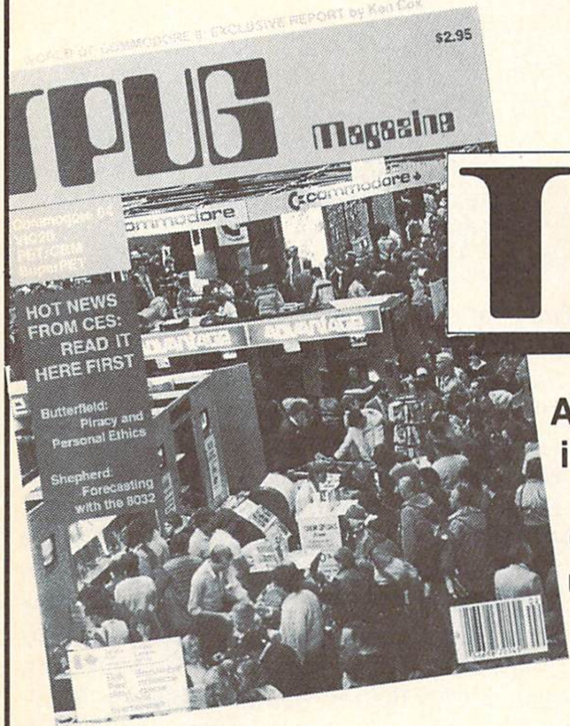
```
•5757 PRINT".";                              EI
•5760 FOR V=0 TO 7                           JO
•5770 LOC=40*7+V*40+8+X                      MD
•5780 IF (PEEK(1024+LOC)AND127)=86 THEN S
 =S+2[UPARROW]V                              AM
•5790 NEXT V                                 NI
•5800 POKE 49152+512+X,S                     GL
•5810 NEXT X                                 NK
•5815 GOSUB 8000                             FN
•5820 GOTO 200                               BO
•5850 FOR X=0 TO 31                          MC
•5860 FOR V=0 TO 7                           JO
•5862 IF PEEK(49152+512+X)=0 THEN 5895       FH
•5865 IF (PEEK(49152+512+X)AND(2[UPARROW]
 V))=0 THEN 5890                             JD
•5870 LOC=40*7+V*40+8+X                      MD
•5880 POKE 1024+LOC,86:POKE 55296+LOC,14     HN
•5890 NEXT V                                 NI
•5895 NEXT X:RETURN                          KH
•6000 SYS 49312:IF PEEK(197)=64 THEN 6000    JP
•6010 GOTO 200                               BO
•8000 S=0:FOR V=0 TO 7                       BN
•8010 IF (PEEK(40*7+V*40+39+1024)AND127)=
 86 THEN S=S+2[UPARROW]V                     FN
•8020 NEXT V:POKE 49152+512+31,S:RETURN      GO
•9999 GOTO 9999                              HB
```

LIGHTNING LOADER
FROM PAGE 74

Starting address in hex: C900
Ending address in hex: CC00
SYS to start: 51456

```
C900: A2 05 BD 0B C9 95 73 CA 0E
C908: 10 F8 60 EA EA EA 4C 11 8F
C910: C9 84 B0 E6 7A D0 02 E6 2A
C918: 7B A0 00 B1 7A C9 51 F0 6C
C920: 05 A4 B0 4C 79 00 C8 B1 BA
C928: 7A C9 93 D0 F4 18 A5 7A FD
C930: 69 02 85 7A 90 02 E6 7B 90
C938: 20 D4 E1 A0 00 C4 B7 F0 1D
C940: 08 B1 BB 99 F0 CB C8 10 E4
C948: F4 A9 A0 99 F0 CB C8 C0 67
C950: 10 90 F8 20 0B CA 78 20 78
C958: C9 C9 A0 01 A2 08 A5 B9 97
C960: F0 06 AC 02 C8 AE 03 C8 49
C968: 84 AE 86 AF 20 93 C9 B0 FF
C970: 08 20 C9 C9 20 90 C9 90 37
C978: F8 58 A5 B9 D0 04 A6 AE 53
C980: A4 AF AD 00 C8 0D 01 C8 22
C988: D0 03 4C 9C E1 4C A1 E1 F6
C990: A2 02 2C A2 04 AD 00 C8 7E
C998: D0 19 AD 01 C8 F0 12 A0 9D
C9A0: 00 BD 00 C8 91 AE EC 01 55
C9A8: C8 F0 06 20 C2 C9 E8 D0 CE
C9B0: F0 38 60 A0 00 BD 00 C8 61
C9B8: 91 AE 20 C2 C9 E8 D0 F5 55
C9C0: 18 60 E6 AE D0 02 E6 AF 38
C9C8: 60 20 D8 C9 A0 00 20 D8 85
C9D0: C9 99 00 C8 C8 D0 F7 60 EE
C9D8: AD 12 D0 29 07 C9 03 90 F6
C9E0: F7 A9 27 8D 00 DD CD 00 E2
C9E8: DD D0 FB A9 07 8D 00 DD AF
C9F0: A2 04 EA CA 10 FC A2 03 FF
C9F8: AD 00 DD 0A 08 0A 26 B0 77
CA00: 28 26 B0 CA 10 F2 A5 B0 23
CA08: 49 FF 60 20 6D CA A9 49 FC
CA10: 20 A8 FF 20 AE FF A9 00 51
CA18: A0 CB 85 B0 84 B1 A9 00 9A
CA20: A0 03 85 B2 84 B3 A9 08 E5
CA28: 85 B4 20 83 CA A9 57 20 F1
CA30: A8 FF A5 B2 20 A8 FF A5 9F
CA38: B3 20 A8 FF A9 20 20 A8 47
CA40: FF A0 00 A2 1F B1 B0 20 25
CA48: A8 FF E6 B0 E6 B2 CA 10 FC
CA50: F4 20 AE FF C6 B4 D0 D2 33
CA58: 20 83 CA A9 45 20 A8 FF 7E
CA60: A9 70 20 A8 FF A9 03 20 10
CA68: A8 FF 4C AE FF 20 AE FF DA
CA70: A9 00 85 90 A5 BA 20 B1 62
CA78: FF A9 6F 20 93 FF A5 90 7B
CA80: D0 0E 60 20 6D CA A9 4D 0F
CA88: 20 A8 FF A9 2D 4C A8 FF 1D
CA90: A2 05 6C 00 03 C4 0D 0E 87
CA98: 4F 4E 2D 52 41 4D 20 0C 70
CAA0: 01 41 C4 0D 43 48 45 01 86
CAA8: 4B 53 55 4D 20 45 52 12 B3
CAB0: 4F D2 0D 46 49 4C 45 20 21
CAB8: 45 52 52 4F 20 0D 0D 0D 39
CAC0: 48 49 4C 4F 41 44 2E 03 A4
CAC8: 36 34 20 56 30 37 32 38 7B
CAD0: 38 32 29 29 43 29 20 31 4B
CAD8: 39 38 32 20 42 59 20 03 5B
CAE0: 4F 45 4D 5F 45 4F 53 05 0F
CAE8: 20 43 55 1B 49 4B 01 1B 6D
CAF0: 53 39 79 19 43 58 59 09 0E
CAF8: 51 5B 19 38 3D 20 35 20 A9
CB00: 4C 19 03 A9 E0 85 00 A5 1E
CB08: 00 30 FC C9 02 90 09 A2 3D
CB10: 00 8A 9D 00 06 E8 D0 FA F2
CB18: 60 78 A9 06 85 31 4C D1 75
CB20: F4 85 08 AD 00 18 4A 90 43
CB28: FA A9 08 8D 00 18 AD 00 28
CB30: 18 4A B0 FA A2 03 A9 00 8D
CB38: 06 08 2A 0A 06 08 2A 0A BC
CB40: 8D 00 18 CA 10 F0 A2 01 55
CB48: CA D0 FD EA EA A9 00 8D EE
CB50: 00 18 60 78 A5 3A 20 21 62
CB58: 03 A0 00 B9 00 06 20 21 FC
CB60: 03 C8 D0 F7 AD 01 06 85 2F
CB68: 07 AD 00 06 85 06 58 60 67
```

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```
CB70: 20 00 C1 A9 12 85 06 A9 43
CB78: 01 85 07 20 03 03 20 64 B0
CB80: 03 A0 07 84 09 A9 00 88 EA
CB88: 85 6F 84 70 20 A9 03 F0 30
CB90: 3D 18 A5 6F 69 20 85 6F 79
CB98: C6 09 10 F0 A5 06 D0 DB C1
CBA0: 20 0F 03 EE 02 06 4C DC F2
CBA8: 03 A0 05 A2 00 BD F0 03 A5
CBB0: C9 2A F0 11 C9 3F F0 07 A7
CBB8: D1 6F F0 03 A9 FF 60 C8 C0
CBC0: E8 E0 10 D0 E8 A0 02 B1 A8
CBC8: 6F C9 82 D0 EF 60 A0 03 49
CBD0: B1 6F 85 06 C8 B1 6F 85 EC
CBD8: 07 20 03 03 20 53 03 D0 4D
CBE0: F8 AD 00 1C 29 F7 8D 00 52
CBE8: 1C 60 00 B2 00 FA 00 BA CD
CBF0: 00 00 00 00 00 00 00 00 F0
CBF8: 00 00 00 00 00 00 00 20 19
CC00: 0E 0E
```

COMMODARES
PROGRAMMING CHALLENGES

Continued from page 110

```
4 REM SOLUTION BY BOB MARTIN
5 REM
10 POKE 88,24
20 POKE 89,121
30 POKE 90,232
40 POKE 91,7
50 POKE 95,0
60 POKE 96,4
70 SYS 41919
80 POKE53281,11:PRINT"+":POKE53281,12
90 Q=0
100 MM=30000
110 NE=1024
120 POKE NE+39-Q,PEEK(MM)
130 NE=NE+40 : MM=MM+1
140 IF NOT (NE>2023) THEN 120
150 Q=Q+1 : NE=1024 : MM=MM+15
160 IF NOT (Q>24) THEN 120
```

Bob uses a built-in ROM memory-move routine in lines 10 through 70. Locations 88 and 89 get the address of the destination and plus one, 90 and 91 get the source end plus one, and 95 and 96 get the address of the source start. The screen characters are copied row by row into a temporary buffer at address 30000 before they are put back onto the screen column by column.

Congratulations to the many other readers who sent solutions to these *Commodares*. Your letters, suggestions, questions, and solutions are always welcome. People with valid solutions who were not mentioned earlier this month include Bill Sherman (Garson, ONT), Michael Springer (Huntington Beach, CA), Jacqueline Callaway (Orange Beach, AL), Gerald Roberts (Green Cove Spgs., FL), G. A. Skaggs (Adelphi, MD), Michael Marron (Stony Brook, NY), Guillermo Gonzalez (Hialeah, FL), Troy Myers (Fort Ashby, WV), Paul M. Lalli (McAlester, OK), Wallace Leeker (Lemay, MO), Len Lindsay (Madison, WI), Terry Moss (Tuskegee Institute, AL), Emru Townsend (Pierrefords, QUE), David Hoffner (Brooklyn, NY), Paul Dawson (Waitsfield, VT), Dale Moose (Plattsburg, NY) and Derrell Harrison (Cabot, AR).

Here is one final program that might provide you with a chuckle. Type this one-liner from Mike Combs (Kansas City, MO) near the middle of the screen (around line 10).

```
1 ?"[HOME][RIGHT][UP][UP][INSERT]":POKE
218,136:RUN
```

Type a line of text on the second line of the screen. Then move to the bottom line of the screen and type RUN. The result is a variation on the *Screen Scramble* theme. It's up to you to figure out what is going on. See you next month. ☐

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Auto Redial	YES	NO
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Upload/Download Text & X-Modem	YES	NO
VT-52/VT-100 Emulation	YES	NO
Menu Driven	YES	NO
28K Software Buffer	YES	NO
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Cable Included	YES	YES
Single Switch Operation	YES	NO
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